# ELECTRICAL REVIEW

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## THE NEW ELECTRICAL REVIEW.

This issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN presents the first concrete manifestation of the new plans and policies which we announced in a previous issue. It is also the first number representing the consolidation with this journal of ELECTROCRAFT, and with this issue a new and more convenient size and arrangement has been adopted. It is believed that the new size of page and of type, combined with the high typographical standard which this journal has always maintained, will meet with the approval of our readers and prove a convenience to them.

This journal will be the exponent of the commercial side of electricity. The keynote of this policy is utility. We shall provide the information which is most needed by and will be most helpful to the commercial department of the central station, to the electrical contractor and to the supply man—information which will prove useful in the every-day problems which arise in the management of these important phases of the electrical industry.

The position held by ELECTROCRAFT as a dominating influence in the field of electrical construction and inspection will be maintained. All the features which were characteristic of that journal in giving it such great practical value to the electrical contractor will be continued. The greater resources of the consolidated journals will insure an even more extended service and an expansion of the influence which has already been exerted in furthering the use of high-grade electrical material and the adoption of the best methods of electrical construction.

THE ELECTRICAL REVIEW AND WESTERN ELECTRICIAN will continue as one of its regular features the section devoted to the answering of questions propounded by the members of the National Electrical Inspectors' Association, as has been done by ELECTROCRAFT in the past. A special department is devoted to electrical construction and wiring, and sections dealing with matters of interest to the supply men and with legal aspects of the public-utility business are timely features. A list of the approved fittings which have been passed by the Underwriters' Laboratories will also be published regularly.

The justification of a publication is its usefulness, and the publishers believe that the electrical industry, and particularly those departments of it that are engaged in the selling of power, the marketing of appliances and machinery, and in contracting and construction work, will quickly realize that the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN is an indispensable source of in-

formation. In its new form this journal will aim to make itself a weekly visitor for which all its readers will look eagerly each week, and which they will promptly consult because it will constitute a practical and up-to-date guide to better and more efficient ways of doing an increasing business.

## ELECTRICAL INSPECTION IN THE SMALLER TOWNS.

In view of the very general disposition on the part of the public to ascribe to defective wiring any fire, the actual cause of which cannot be positively determined, one would logically expect to find provisions for preventing the installation of such wiring in every community favored with electric service. An examination of the actual conditions, however, discloses the interesting and unfortunate fact that in very many of the towns and smaller cities of the country such provisions are either quite inadequate or else wholly non-existent. In many of these towns, in fact, the property owner, if he is electrician enough to install a switch and connect multiple lamps in between opposite sides of the circuit, may wire his own premises; or, if he prefers, he may leave the job to some other individual equally lacking in skill as a wireman. Then the manager of the local central station, pleased with the prospect of securing even a temporary increase in station load and desirous of avoiding the ill feeling that might result from any criticism of the wiring, often connects the service to such installations without having them subjected to any sort of inspection at all.

In an effort to avoid such conditions as these, some towns have passed ordinances restricting electrical wiring to the parties duly registered with the proper officials as *bona fide* contractors or wiremen. This provision, however, has not always proved a very effective remedy. While the registered contractor may himself be very efficient, there is always the possibility of his having to trust important jobs to unskilled and irresponsible assistants. Cases have arisen, in fact, where the contractor himself, in an effort to keep from losing money, has permitted himself to become the victim of the unfortunate but sometimes very convenient delusion, that certain Code requirements are refinements which need not always be followed very closely in practice.

The only really effective means of avoiding such highly undesirable practices as the foregoing, is to be found in a well ordered local system of electrical inspection. To provide and maintain such a system, however, has proved in the case of many of the smaller towns a rather difficult matter. Where the local central station is owned by the municipality, the central-station manager is often also the electrical inspector. But the wisdom of such an arrangement is always open to serious question; for the desire on the part of this particular official to push the sale of electric power is quite liable to cause him to commit the unfortunate blunder of encouraging cheap and undesirable types of construction. What seems to be the best solution of the matter in question is to place electrical inspection under the direction of the fire department. In some towns this has been tried by making the fire-chief also chief inspector—or perhaps the only inspector—and the plan is reported as working well.

It should be explained that it is not intended in the above remarks to place undue emphasis on any risk incident to the use of electric service. Electrical illumination is by far the safest of all methods of artificial lighting, and electricity also affords the most convenient and one of the safest of all means for the distribution of power. But that there may be a fire hazard where the wiring is not properly done is too well known to need comment here. The avoidance of such wiring by means of adequate inspection and the encouragement thus of the better and more substantial types of electrical construction, is highly desirable always, not only from the standpoint of the property owner, but from that of the central station and electrical contractor as well.

## ELECTRIC POWER SUPPLY OF THE MODERN LAUNDRY.

In the present issue we publish a comprehensive article dealing with the power requirements of the modern electrically-driven laundry. There is hardly any doubt that the laundry affords the central station a great deal in the way of difficulty in meeting with the peculiar conditions which surround this industry. The necessity for hot water and live steam make necessary a heating equipment and in many cases the generation of power is considered incidental to the other requirements. Electric drive, however, has undoubted advantages, and in this article these are clearly pointed out and the information can be utilized by the power solicitor of the central station in getting business of this nature. The data given with respect to power requirements, motor characteristics, load-factor, control equipment and wire are authentic and have been secured as the result of a careful investigation of actual conditions as they exist in laundries now utilizing central-station energy.

As is pointed out in the article, the electrical requirements of the laundry are considerable and this class of business affords an attractive prospect for central stations, the manufacturers of and dealers in current-consuming apparatus, and electrical contractors. In several directions electric laundry equipment is of a very special nature, and it is with particular regard to this that the article will be found most helpful.

In subsequent issues it is proposed to supplement the information respecting the electrical requirements of the laundry, and we will also discuss the application of electrical energy to other industries. In the next issue there will be a special study of the power requirements and the opportunity for electrical service in the paper-box industry.

## RATE-MAKING AND THE RATE RESEARCH COMMITTEE.

The Rate Research Committee of the National Electric Light Association is preparing its second report, which will be presented at the Seattle convention next June.

Wherever rate-making is being discussed the data in the possession of the committee will be found valuable in the event of a paucity of information upon the part of the small central station. This information is freely at the disposal of those who may have need for it, and by the same token the information should be given freely to the committee.

This work presents an opportunity for the best sort of co-operation, and the example set by those companies that have appointed a member of their organization to assist in the work of the committee should be followed to the extent of the resources of every company in the country. Hardly any but the large companies are prepared to take up the fundamental questions involved, and a controversy might prove disastrous where antagonistic interests dominated the investigation. The establishment of standard methods, with incontrovertible data to back up the reasons for applying such methods, will place the central stations in a position where they will be safe from damage either through ignorance or malice.

## THE YEAR IN THE ELECTRICAL INDUSTRY.

In reviewing electrical developments during the past year, a great many things stand out as indicating the trend of developments. Without doubt there has been a great quickening in the minds of the managers of public service companies of the necessity for sharing the full confidence of the public upon whom they depend, and of the desirability of the most modern and enterprising measures of publicity in order to secure the confidence of the people.

On other pages we publish a review of the year in the electrical industry. Summarizing briefly it appears that in telephony the advances have been of a commercial rather than technical nature with improvements in long-distance construction and in the building of telephone subways. Telegraph cable systems are producing a much better revenue due to a more efficient co-ordination of the various departments and the establishment of low rates for certain classes of service. In wireless telegraphy the long-distance high-power station between Coltano, Italy, and Glace Bay, N. S., is the big development.

In electric lighting the introduction of the wire-type and drawn-wire tungsten-filament-type lamps have had a far-reaching effect in extending the use of these light sources. Arc lamps, particularly of the flaming type, have had some development and the introduction of practical long-hour burners has increased the popularity of this source of light.

Electric railways have made very satisfactory progress. The Hoosac tunnel electrification of the New York, New Haven & Hartford, and the 11,000-volt single-phase electrification of the Harlem Division of the same road will give a great impetus to future electrifications. The proposed electrification of the Boston Metropolitan District by the New York, New Haven & Hartford. and the Stamford-New Haven extension are in line with movements that are gaining ground in large cities the country over. The Illinois Central Railroad and the Association of Commerce Committee on Electrification in Chicago are working together for the devising of a feasible plan of electrification.

In engine construction the year has seen the completion and installation of the first 20,000-kilowatt vertical Curtis turbine at the Waterside Station of the New York Edison Company.

There has been a great increase in the demand for electric vehicles, both of the pleasure and commercial-truck type. The improvement of the storage-battery element, the development of a compact light-weight motor and control equipment, and the establishment of charging facilities have been rewarded by a great appreciation on the part of the public of the advantages of the motor-driven vehicle.

## THE ANNUAL MEETING OF THE AMERICAN PHYSICAL SOCIETY.

The recent meeting of the American Physical Society, held in conjunction with the American Association for the Advancement of Science, was one of the best attended and most interesting meetings ever held by that society. The number of papers presented established a record, and in the presence of men prominent in science it was probably second to none.

A large majority of the papers presented at such a meeting are ultra-scientific and have little interest to the man in the street. It is true, however, that many inventions of world-wide importance have their inception in such investigations as engage the attention of these scientists—investigations which are instituted in the pure spirit of scientific research, the desire to learn nature's secrets, to know the truth. It is such researches as were carried on by Franklin, Ampére, Faraday, Henry and others, which made the electrical industry of today possible. And it must be remembered that at the time such researches are made, there is usually no perception of the possibility of their industrial application.

It is consequently very desirable, even from the standpoint of the engineer and the commercial man, that research should be carried on purely for its own sake and not merely because of any obvious applications to the every-day service of mankind.

On other pages of this issue will be found a brief report of the meeting, with detailed mention of only a few of the many papers presented. These papers contain matter which will be of interest to the practical electrician and the engineer.

**Farewell Luncheon to J. G. Pomeroy.**

The regular meeting of the Electric Club of Chicago on December 27 took the form of a farewell to its treasurer, James G. Pomeroy, who has accepted a position as sales manager of the Adams-Bagnall Company, of Cleveland, O.

A number of members were called upon for reminescences and remarks and many things of interest to those present were recalled.

C. A. S. Howlett spoke of work similar to that of this organization, which is being carried on in New York. That body meets bi-weekly and, like the Chicago body, has a noonday lunch, after which some speaker takes the floor, or a general discussion ensues. At the first meeting of the "Jovian Lunch Club," by which name the body is known, 100 members were present, and at the second, the membership increased to 135. Mr. Howlett, in closing, especially commended Mr. Pomeroy regarding his policy of financing affairs and spoke of the amount of money that has accumulated in the treasury.

Mr. Pomeroy, in making a few farewell remarks, mentioned some of the electrical clubs of other cities, comparing them with the Chicago club. He especially advocated the lunch-club feature and attributed the success of the body largely to that point.

Short farewell remarks and toasts to "Jim" Pomeroy were made by Frederic P. Vose, Perry Boole, Edward F. Kirkpatrick, A. L. Millard, W. R. Pinckard, W. E. Keily, Charles E. Gregory, S. T. Dibble, A. A. Gray and others.

As a parting gift a very handsome traveling bag was presented by the club.

**Louisiana Contractors Elect Officers.**

At the annual meeting of the Louisiana Electrical Contractors' Association, held at their comfortably furnished headquarters, 625 Poydras Street, New Orleans, the following officers were unanimously re-elected: Roydan Douglas, president; Thomas J. Burke, vice-president; Henry Widmer, treasurer; W. H. B. Spangenberg, secretary; and W. H. Earl, sergeant-at-arms.

**Washington Society of Engineers Holds Annual Meeting.**

At the annual meeting of the Washington Society of Engineers, held on December 20, officers for the year were elected as follows: president, John H. Hanna, of the Capital Traction Company; vice-president, Frank Sutton, of the United States Geological Survey; secretary, John C. Hoyt, of the United States Geological Survey; treasurer, H. B. Stabler, of the Chesapeake & Potomac Telephone Company.

An address was made by George W. Littlehales, and was followed by a smoker.

**Convention of Byllesby Companies.**

The third annual convention of H. M. Byllesby & Company and affiliated companies, was held at the Congress Hotel, Chicago, January 2 to 5. On Tuesday morning, January 2, there was an informal reception at the office of H. M. Byllesby & Company from 10:00 to 11:00, and at 11:30 a. m. the representatives in assembly were welcomed by H. M. Byllesby, who made an inspiring address and told in detail of the great development and prosperity which had marked the progress of the organization during the past year. Mr. Byllesby expressed his hearty appreciation of the ideal conditions that existed among the companies connected with the Byllesby organization, and emphasized his belief that everyone in the organization would live up to the opportunities which lay before them. The great responsibility which attached to the carrying out of the policies of the company so that the interest of the owners of the securities, the faith that the big financial institutions of the country tendered to the company with respect to its credit, and the hundreds of thousands of consumers served by the companies might be conserved, was a heavy one, but that was appreciated and carried without flinching.

Meetings were held both morning and afternoon of the balance of the week, when papers were read and discussed by various speakers.

On Wednesday evening Mr. and Mrs. Byllesby tendered a reception to their guests at their home on Drexel Boulevard. On Friday morning there was an address by B. E. Sunny, president of the Chicago Telephone Company, and later in the morning an address by T. C. Martin, secretary of the National Electric Light Association. The banquet was held at 7:30 p. m. on Friday. About 150 representatives of the company were present, among whom were A. S. Huey, O. E. Osthoff, George H. Harries, J. S. Cummins, J. J. O'Brien, R. J. Graf, Errett L. Callahan, Harold E. Almert, W. H. Hodge, and T. K. Jackson.

**Annual Meeting of the Illuminating Engineering Society.**

The annual meeting of the Illuminating Engineering Society will be held at the Machinery Club, 50 Church Street, New York City, on Friday evening, January 12, at 6:30 o'clock. The meeting will be preceded by a dinner, the price of which will be $2.00. Business suits will be in order. The committee in charge intends to make this meeting interesting and has provided an excellent program. Announcement of the election of new officers will be made and their inauguration will take place.

**Merger of the Wire Inspection Bureau With the Underwriters' Laboratories.**

Announcement is made of the establishment of a single factory inspection and labeling service for rubber-covered wire, this arrangement to be operative after January 1, 1912. This is the result of a merger of the Wire Inspection Bureau service on National Code rubber-covered wire with that of the Underwriters' Laboratories. Thus inspection will hereafter be under the single control of the latter organization and will be based upon specifications and procedures growing out of the best thought and experience of the Underwriters and the manufacturers of rubber-covered wire. In addition to the inspection, testing and labeling of wire at the factories, a very thorough follow-up system will be employed to keep track of how well the products of the various factories are meeting the requirements of actual service. The object sought of course is to prevent the use of rubber-covered wire which does not come up to the standard set by the National Board of Fire Underwriters in the 1911 specifications; or, in other words, to prevent the further use of wire having defective rubber insulation.

It is interesting to note in this connection that the specifications just mentioned differ quite materially from those previously applying to wire of the class in question. New electrical, physical and chemical tests are called for with the intention of securing a better quality of insulation than has been prescribed in the past. The majority of the rubber-covered wire manufacturers adopted the new tests and system of labeling on January 1. Time is allowed them, however, to dispose of old-Code wire not bearing the new stamp of approval which was on hand prior to the above date, it being provided that such stock must be disposed of before July 1, 1912.

The electrical departments of some of the cities have already taken the necessary steps to promote the discontinuance of the use of old-Code wire. William Carroll, city electrician of Chicago, for example, has notified the contractors and others in the city interested in the matter that after January 1 all wires in sizes from No. 14 to No. 4-0 must comply with the new specifications, and that after July 1 all wires in sizes from 250,000 circular mils up must comply with the same requirements.

**New Bonds for Milwaukee Railway.**

A special meeting of the Milwaukee Electric Railway & Light Company was held in Milwaukee, to vote upon the proposal to authorize $90,000,000 bonds. Part of the bonds are to be reserved to retire underlying bonds as they become due, and the proceeds from the balance for improvements.

## J. Robert Crouse.

It is fitting at the time when the land is pulsing with the spirit of fraternity and efforts are being made in every direction to arrive at practical methods of effecting harmony of action between all classes of men, that a tribute should be paid to one, a large portion of whose life work has been devoted to the quickening of the impulse of a co-operation among his fellow-beings.

J. Robert Crouse is by nature a co-operator. For many years, undaunted by almost insuperable obstacles, and in the face of indifference and skepticism, he has hammered away at the gospel of creating a better feeling among men engaged in similar lines of business and the principles which he has expounded and exemplified are now accepted as a very potent element in the working out of big business problems in the relation of producer to consumer.

The year 1911 has seen a great development of interest and active participation in the establishment of co-operative ideas for the promotion of better conditions throughout the electrical industry. It has been realized that public utilities must depend for their success upon the co-operation of the public in the use of the commodity to which these great public utilities are devoted, and after engineering and technical perfection is reached, commercial ideas must prevail so that there will be created the greatest possible demand for the services of the utility companies. In between the public and the public service companies are the dealers in electrical material and the contractors devoted to electrical construction, and correlated with the work of both the public service companies and the distributors and contractors are the manufacturers of current-consuming devices. To harmonize the interests of all and create a condition of co-operation that will eliminate waste effort is the ideal sought for by such men as J. Robert Crouse.

Back in February, 1905, certain manufacturers of incandescent lamps conceived the idea of effecting a co-operative plan of bringing before the public the advantages of better lighting, and on May 12, 1905, the lamp manufacturers appropriated $10,000 to put the initial plans into effect. As the plans developed it was seen that a broader scheme of co-operating with the distributing trade was possible, and this scheme was elaborated in a paper presented before the National Electric Light Association at the Denver meeting in June, 1905. A committee of three central-station managers was appointed to co-operate in the further development of the work, and the subject in its broader aspects was presented again to the lamp manufacturers on February 11, 1906. It was unanimously endorsed and an appropriation of one-fifth of one per cent on their entire sales covering a period of three years was made. This broadened development led to the adhesion of other manufacturing interests, and in March, 1906, a co-operative committee, including the representatives of manufactures of other electrical apparatus was formed.

**J. Robert Crouse.**
A Leading Spirit in the Co-operative Development of the Electrical Industry.

During this time the technical press of the country had become actively engaged in stimulating central stations to the possibilities of more enterprising merchandising ideas. During 1906 there were over a thousand columns of the technical press devoted to the subject of getting new business, and reports from 934 central stations showed that ninety-six stations had organized new business departments, that 165 had added solicitors to their staffs, that 193 had begun direct advertising, that 232 had begun newspaper advertising, that 195 had increased their advertising appropriations, that 165 had opened up display rooms, and that 188 had begun the operation of their own electric signs.

In all of this work Mr. Crouse had been the active spirit, and the impetus given to the co-operative movement at that time has found its reflection during the past year in the establishment of the Commercial Section of the National Electric Light Association. Mr. Crouse was the first chairman of the Commercial Section, and in building up the membership of this Section he brought to bear the same great energy and ability as had characterized his former efforts. To stimulate the interest in the building up of the membership of the Commercial Section he donated a beautiful silver loving cup for the member who succeeded in bringing in the greatest number of applications for membership, and this was presented at a banquet given by Mr. Crouse and George Williams at the Hotel Martinique at the time of the National Electric Light Association convention of last year. It is thus in a purely personal capacity that Mr. Crouse has exercised a powerful influence over everyone with whom he has come in contact. He is possessed of a magnetic individuality, is forceful in appearance and expression, and radiates enthusiasm for the project which he is interested in.

Mr. Crouse is a graduate of Michigan University, of the class of 1897. After his graduation he was actively connected with the Fostoria Incandescent Lamp Company and the Fostoria Glass Specialty Company, Fostoria, Ohio. Since the formation of the National Electric Lamp Association he has been active in that organization in general office work and in an advisory capacity. He was chairman of the Commercial Program Committee of the National Electric Light Association in 1906, 1907 and 1908, and chairman of the General Membership Committee of the Association in 1908. He is an enthusiastic member of the Rejuvenated Sons of Jove, and was Seventh Jupiter of the order, in 1909. During his reign he brought about many changes in the attitude of the electrical fraternity with respect to the order, and there has been a great gain in membership ever since his administration. That his ideas have taken firm root is evidenced by the fact that all over the country there are being started Jovian lunch clubs, the keynote of which is the promotion of harmony and co-operation among the various elements of the electrical industry.

### "Cooperation in the Electrical Industry" at the New York Jovian Lunch Club.

At the fourth meeting of the New York Jovian Lunch Club, held on December 27, with an attendance of 152, the speaker of the day was T. C. Martin, secretary of the National Electric Light Association. His subject was "Cooperation in the Electrical Industry."

The keynote of Mr. Martin's address was the realization on the part of the central stations of the country that the sale of electric current to the public was a "commercial" industry, and though, while the big men of the industry realized that their entire business depends on the service which they give to the public, and that they must continue to bend their energies towards more efficient service, they have been spending entirely too much time and thought on the purely technical side of the business, and the big important factor which they were facing and must face was the fact that they were public service corporations, and that as such their existence and success needed closer cooperation directly with the public. To achieve this cooperation they must not only adopt policies that would bring them into closer touch with the public, but must in every way cooperate and get in closer touch with the contractors and jobbers as distributors and with the manufacturers of current-consuming devices which were supplied to the public, and by this closer cooperation could avail themselves of the increased confidence which would come from such cooperative methods.

The earnings in the lighting, heating and power companies of this country were over $375,000,000, and the public would pay this year something over $1,800,000,000 for electrical service. This brings out forcibly the fact that as it is the public which the central stations must depend on for their existence and success and even for the legislation which affected them, that the public service corporations must have the support of the public, and must be in the confidence of the public, and that the public must be in their's, and that they had reached that stage in the industry where all must work together for the common good.

Mr. Martin suggested that there must be some way in which the National Electric Light Association and the Sons of Jove could work together for the benefit of the industry as a whole, and that possibly the way might be through the various local organizations in the different parts of the country, taking up definite practical lines of work for the benefit of the industry in the city in which they were located. He spoke of the harmony which the various luncheon clubs engendered among their members, and of the possibilities for practical cooperative development work which this harmony made possible.

President John F. Gilchrist, of the National Electric Light Association, in a recent meeting in Chicago had suggested that in the near future it might be well to broaden the scope of the National Electric Light Association so that all interested in the electrical industry could work as one organization in absolute harmony, and went so far as to suggest that a change of name from the National Electric Light Association to National Electrical Association, or even to International Electrical Association, might be a wise move.

The next meeting of the Jovian Luncheon Club will be held on January 10, and at that time an announcement will be made of the Jovian rejuvenation which will shortly be held. Frank P. Watts, chairman of the meeting, announced that he had already seventy applicants for membership in the Sons of Jove, and that by the time the meeting was held he believed there would be not less than 250 applications for membership to the New York Jovian order.

### Central Stations Cooperating with Rate Research Committee of the National Electric Light Association.

In 1911, the Rate Research Committee, under the chairmanship of John F. Gilchrist, now president of the National Electric Light Association, outlined an important work with the object of encouraging uniform methods of rate making throughout the country and eventually uniform rates as far as practical.

The committee in that year made careful study of rates and rate methods throughout the country. If the central stations now making new rate schedules would carefully consider the conclusions reached in that report, an entering wedge toward a general uniformity would be started, it would be extremely beneficial both to the central stations and to the consumers.

The recommendations made for residence rates in the 1911 report were as follows:

Fair Return.—Your committee is of the unanimous opinion that the charges as a whole should be no more than sufficient to pay expenses plus a profit high enough to attract capital into the central-station business. This, however, does not mean that each customer should necessarily pay the same profit or give the same return on his portion of the investment as every other customer, so that a so-called maximum rate with the customary minmum for meter rent, breakdown service, etc., will be entirely proper, especially when demanded by public opinion, even if some particular customers are served at an apparent loss.

Minimum Charge.—The committee is unanimous that any rate should include a minimum charge per month or per year.

Differential.—The committee is by no means unanimous as to whether a differential for residence business is desired but is unanimous that if this is adopted either a plain wholesale or a differential basis on hours' use of maximum demand, or its equivalent, is the best.

Floor Area.—Your committee recommends that floor area is the simplest, fairest, cheapest and most practical, constant and easily understood method of determining such a differential, although your committee has no recommendations to make as to whether this should be used directly or reduced to the number of rooms.

If these recommendations were adopted by all companies planning a change of rates and a gradual simplification of residence rates should occur throughout the country, a great deal would be accomplished.

The committee for 1912, E. W. Lloyd, chairman, is now at work upon additional recommendations which will be issued in its 1912 report, but if any central stations are contemplating a change of rates to become effective before the 1912 convention, the committee will be glad, through its secretary, William J. Norton, 120 West Adams Street, Chicago, to offer its suggestions and advice to such companies so that they will get the benefit of the work of the committee.

Many of the companies, realizing the importance of the work of the Rate Research Committee, have nominated one of the officers of their own company to act in co-operation with the Rate Research Committee, and such companies as have not made such a nomination are cordially invited by the committee to send in the name of one of their officers to act as an assistant to the Rate Research Committee during this year.

### Wireless Without Masts.

William Marconi, while on a recent trip in Tripoli, is said to have discovered that wireless messages may be transmitted over the desert without the use of masts for supporting aerial antenna. The wire was simply laid on the sand parallel to the direction in which the message was to be sent. The receiving antenna is arranged in a similar manner, and it was found that messages could be transmitted as well as with the customary system.

### Heavy Electric Railway Traffic.

It is reported that the interurban railway traffic in the region about Indianapolis, Ind., was very heavy during the Christmas holidays. On Christmas Day the Indianapolis, Columbus & Southern Traction Company experienced the largest receipts of any day in the history of the road. S.

# A Review of the Year in the Electrical Industry.

Taken as a whole the progress of the electrical industry during the past year must be considered generally satisfactory. While there have been no startling advances either in discovery, invention, or application of new ideas, substantial development has taken place in practically every line of endeavor. It is true that the gains have not been as great as might have been expected, considering the vast opportunity for the extensions of familiar uses of electrical energy, and the application of electrical working in many directions not as yet cultivated as intensively as could be desired. The activity of the Department of Justice of the Federal Government against the manufacturers of incandescent lamps and the manufacturers of bare and rubber-covered wire, together with the breaking up of pooling and selling arrangements, has brought about an instability of price relations. The general misconception regarding enormous profits in the manufacture and sale of a number of lines having wide application in electrical construction, has developed not a few manufacturing and selling concerns who, without sufficient knowledge of all the facts in the case, have gotten into business on a low price basis and brought about a demoralized condition so far as relative values and reasonable returns are concerned. This being the case, it is safe to say that while in many directions the volume of business has been great the net has been decreased owing to the heavy expense involved in selling campaigns and the small margin of profit which has resulted from the elaboration of discounts.

A general review of the outstanding developments which have appeared to mark essentially the points of progress in the several great divisions of the electrical industry, is given on the following pages.

A complete summary of the activities in the commercial field of the electrical industry, with a compilation of figures, obtained from reliable sources, showing the extent of electrical manufacturing and trade during the year, is presented in a statistical table at the end of this review.

## Telephony and Telegraphy.

Developments in telephony have been, to a great extent, along commercial rather than technical lines. The increasing tendency towards the reaching of some sort of a working arrangement between the American Telephone & Telegraph Company and the various independent interests is conferring a distinct benefit upon both the companies and the subscribers. The resultant increase in efficiency of management and the elimination of wasteful expenditure is making possible a better grade of construction and a more careful selection of material so that telephone service as a rule is being viewed with constantly increasing favor upon the part of the public.

Automatic systems have continued to grow and in some localities have achieved considerable vogue. The year has marked the introduction of the automatic telephone system on a large scale in Chicago, although at the present writing there is some dispute between the city council and the electrical department having jurisdiction over the telephone system as to the absolute number of subscribers connected up. It is presumed, however, that the company operating the automatic telephone system has complied with the requirements under which their franchise was granted.

Comparatively little new construction work has been undertaken during the past year, particularly among the independent companies. This is without doubt a healthy sign since it has been accompanied by an effort on all sides to get the most out of the facilities already provided, to place plants in better condition, and to put operating methods on a better basis.

During the past year, a marked advance has been made in the range of long-distance telephony which resulted in the American Telephone & Telegraph Company opening for commercial service a telephone line from New York to Denver. This advance was made possible by the successful application of loading to large-gauge copper circuits and to phantom circuits derived from these large-gauge copper circuits. This loaded phantom construction provides from two pairs of wires, three high-grade, non-interfering telephone circuits, and, in addition, provides facilities for eight simultaneous non-interfering telegraph communications. In addition to the application of this system to the New York-Denver circuit, it has been applied very largely to other long lines of the telephone company.

During 1911, the American Telephone & Telegraph Company has extended its subway system very substantially by completing a subway from New York to Boston. This subway when equipped with cable and worked in conjunction with the previously constructed subways of the company, will provide continuous underground telephone and telegraph facilities for all of the principal seaport cities between Boston and Washington, a distance of 500 miles. The existence of such a system will eliminate the hazard of interruption from storms.

The scheme of co-operation between the Western Union Telegraph Company and the American Telephone & Telegraph Company, which was introduced in 1910, has been substantially extended during the past year. This co-operation has been evidenced by starting construction on a new building at the wire center of New York to be used jointly by the telephone company and the Western Union Telegraph Company. The same policy has been evidenced by the establishment of central office buildings for combined telephone and telegraph use in other localities. Interchange of wire facilities and the utilization of wires for combined telephone and telegraph working have been extended during the year and co-operation evidenced by the arrangements made whereby the telephone is used for the transmission of telegrams between telephone subscribers and telegraph offices.

The success of the reduced rate night letter introduced by the Western Union Telegraph Company in 1910 was such that during 1911 the night letter was supplemented by the introduction of the day letter which provides for a fifty-word day telegram at one and one-half times the night letter rate. This service has become very popular.

The application of the same principles is establishing just as satisfactory results with regard to trans-Atlantic cable systems, and early in the new year it is expected that negotiations which have been in progress for some time will have reached a satisfactory conclusion for the opening up of a much greater use of cable facilities. Already the deferred cable service and cable letters have been inaugurated at very low rates. This is to fill up the spare cable capacity during many hours of the day when the traffic is at a minimum. The deferred cablegram is liable to be deferred for those paid for at full rates for a period not exceeding twenty-four hours and the cable letter will reach London or Liverpool in time for delivery on the morning of the second day following its receipt at New York or Boston. To this has been added the week-end letter which may

be filed up to midnight on Saturday for delivery at London or Liverpool on the following Tuesday morning. These new services enable the public to save the six or eight days consumed in trans-Atlantic mails and are intended to place the Atlantic cables within the reach of all at rates which will encourage their use for social and business communications.

On the technical side the most important development in cable telegraphy during the past year is undoubtedly the invention of E. S. Heurtley of London, for the magnification with increased speed of submarine cable signals and the automatic translation of the signal from one cable to another.

## Wireless Telegraphy and Telephony.

No radical discoveries in wireless apparatus have been made during the year. The trend of development has been along the line of more universal use of quenced-gap apparatus and 500-cycle generators. The knowledge derived from the experiments from the scout cruisers *Salem* and *Birmingham*, and the Brant Rock station by the Navy Department is proving to be of much use in the designing of new stations and in minimizing the importance placed on occasional long-distance wireless communication records. It appears that this work has shown that these are accidental; that is, depending upon atmospheric conditions and not at all upon the excellence of the apparatus. The high-power Marconi station at Coltano near Pisa has been completed for the Italian Government and this is held to be the most remarkable event which has taken place in long-distance wireless transmission. The Marconi Wireless Telegraph Company announces that the transmission of a message from Coltano, Italy, to Glace Bay, N. S., direct, containing some nineteen or twenty words, has not taken for the wireless transmission more than a half a minute.

A number of quite important patent actions have been brought this year, the Marconi Wireless Telegraph Company, Limited, of London, under its patent No. 7,777 recovering a judgment against the British Radio Telephone & Telegraph Company whereby the said patent was fully established, the judge intimating that in his opinion persons using tuning, which is an absolute part of wireless work, are infringers of the above-mentioned patent. While this does not actually apply to America, English rulings have been upheld in many instances and actions have been commenced by this company against several corporations in this country using similar systems. It looks as if the whole matter would be thoroughly thrashed out and the rights of the various claimants would be established one way or the other.

There have been a number of notable instances where wireless has demonstrated its practical utility as a means of sending signals of distress from ships at sea and effecting timely rescues, and in establishing quick communication in emergencies of a commercial nature. An important recognition of wireless as a safety device at sea has come in the form of the new law requiring it for all passenger ships touching at American ports.

The 100-kilowatt Navy Department wireless station at Arlington, opposite Washington, D. C., has been started. This station is to have one tower 600 feet high and two 450 feet high, and is expected to have a 2,000-mile range for communication with ships, with a possible extension to 3,000 miles by means of kites flown from ships. The foundation work on the towers is completed and the steel work begun, and it is expected the station will be ready for work about July 1 next. While attention has been directed mainly to long-distance achievements and trans-oceanic service, one of the striking and significant advances has been the application made in the far west to overland telegraphy in competition with land lines.

Quietly and in fact comparatively unannounced the Federal Telegraph Company, operating under the Poulsen patents and with many improvements introduced by American engineers, has connected San Francisco with Los Angeles, San Diego, Phoenix, Arizona, El Paso, and Ft. Worth, Texas, with Kansas City on the east and north to Medford and Portland, Oregon. It is claimed that communication furnished between these cities has proved reliable by day and night, and service has been maintained for more than eight months. Thus far the wireless business is derived chiefly from commercial firms, banking houses, exchanges and the like. It is stated that this service will be extended within the next sixty days to Chicago and Seattle. Long wave-lengths are employed, avoiding interference with and from spark telegraph stations, while the peculiar methods employed in signaling by merely effecting a five per cent (or less) change in wave-length and the use of continuous radiation make the picking up of messages by eavesdropping detectors impracticable.

## Electric Lighting and Illuminating Engineering.

The year just closed has brought material advances in practically all aspects of eletric lighting. Although the developments were not of a radically new nature, there was such steady progress on the whole as to constitute a worthy achievement of a twelvemonth that in many lines was exceptionally dull. In a nutshell, electric lamps have been improved, electric lighting has been largely extended, both in new fields and old, and finally it has been more intelligently made use of for exterior as well as interior illumination.

Taking up the illuminants themselves, the most notable development doubtless is the general introduction of the wire-type and drawn-wire tungsten lamps. These improvements have had a far-reaching effect in extending the use of tungsten lamps; they have removed substantially the last objections to their general employment in place of the low-efficiency incandescent and even arc lamps. The ruggedness of the new lamps is such that breakages have been reduced to almost negligible proportions; this feature alone has added to the tungsten lamps a competitive value that is making heavy inroads on nearly every other illuminant.

The large tungsten lamps (250 to 500 watts) have given such a good account for themselves that they have come to be used in many places where incandescents were formerly considered impossible. On the other hand, there is a distinct development now in progress toward low-wattage tungsten lamps for standard voltage, as the result of which competent lamp men predict a general movement toward the adoption of high-efficiency lamps for residential lighting within the next twelve months.

Although the sales of carbon incandescent lamps have not as yet diminished, the tungsten-lamp developments referred to, together with the last year's improvements in the metallized-filament lamp, are surely hastening the retirement of the carbon lamp even in those few cases where possibilities of theft or of mechanical breakage from exceptionally severe treatment will not as yet warrant the use of a high-efficiency lamp.

Tantalum lamps are still very largely

used for direct-current traction service. Even in this field, however, the drawn-wire tungsten lamp is being successfully employed and bids fair to drive tantalums out of their last stronghold.

In the older types of arc lamps no very important improvements have been made. The various types of these lamps continue in some demand. There is a decided tendency for their replacement, however, by the more modern and efficient arc, vapor and even tungsten lamps.

Magnetite arc lamps have been improved in several details, such as reduction in weight, better design of glass globes, adaptability to decorative street lighting, etc. In the latter respect a notable installation at New Haven, Conn., was recently made in which a unique and compact design of this lamp was mounted on an ornate column with excellent results both by day and night.

A most important development in flaming arc lamps was the introduction of the long-burning impregnated-carbon electrode. This feature alone has made the lamp much more serviceable for all high-power illumination and particularly for the lighting of important streets, in which it is now bound to be used as extensively as in Europe. Together with the long-burning electrodes have come a much more compact design of the lamp and better light distribution, all these aiding materially in extending the use of this powerful and efficient illuminant.

In vapor lamps improvements have been made that have increased the scope of their possibilities. A new compact form of Moore tube has been developed that makes possible its ready installation in place of other standard forms of lamps. The white Moore tube is used more extensively than ever for places where exact color matching must be done.

The further development of the light-transforming reflector has given to the standard Cooper Hewitt lamp a new sphere of usefulness where its characteristic greenish hue had formerly barred it. These reflectors provide sufficient red rays to give a closer approach to daylight. A somewhat similar result has been attained by the development of the combined circular tube and tungsten lamp. The mercury-vapor tube is bent into circular form so as to surround a large tungsten lamp. As made up into a ceiling bowl the entire unit is an efficient and pleasing combination.

All types of Cooper Hewitt lamps have been made equally suitable for alternating-current as well as direct-current service. Due to the increased life of the tubes, the average maintenance cost of the lamps has been steadily reduced. There has been a marked increase in the use of the standard mercury-vapor lamps in all places where they have been found applicable, particularly for industrial lighting, photographic purposes, etc.

The quartz-tube mercury-vapor lamp, which had been developed in Europe to a considerable extent, was last year placed on the market in this country also. Although but a limited number have been tried out here, they have fully met the expectations and it is believed will develop into strong competitors of both the old and more modern lamps.

Along with the developments in various types of electric lamps have come almost equally important developments in lamp accessories, such as reflectors, shades and globes of all kinds. New forms of reflectors for special lighting problems are being brought out every day. There has been an enrichment in the number of materials available, particularly in illuminating glassware. The number of opal reflectors giving excellent diffusion without excessive absorption has materially increased and a much more general application of such reflectors and shades is at last in evidence, surely a good sign of the times.

With open domes and reflectors, the frosting of the lamp tips is becoming more common. The value of improved diffusion and the need for eliminating glare are better understood. Even for outside service there has been a greatly increased use of diffusing glassware, especially in connection with high-power lamps whose high intrinsic brilliancy produces dazzling glare unless the light-source is suitably screened.

A most hopeful feature of the year's development was the remarkable attention which was directed to all problems of illumination. Through various agencies, such as illustrated lectures, also special articles in the press, a broad educational work on the principles of good illumination has been carried on. This has stimulated interest in the whole subject and called attention to defects that needed to be remedied. This campaign for improved lighting conditions has been conducted by the lighting companies, the lamp manufacturers and the makers of lighting accessories. Although primarily undertaken for stimulating business, much good for the cause of improved illumination in general has been produced. In a year in which retrenchment has been the watchword, particular attention has been given to efficiency and therefore many old types of lamps have been replaced. In nearly every case, however, in consequence of this endeavor to secure better results from existing installations alone, other features aside from efficiency have been improved.

Many of the larger central stations and the manufacturers of lamps and reflectors have established illuminating-engineering departments to aid their patrons in effectively solving problems of illumination. The more intricate problems are left to the consulting illuminating engineer. As a result, the adaptation of lamps in the most efficient manner to specific purposes is gaining a point in engineering activity almost equal to the engineering skill devoted to the design of the lamps themselves. Highly efficient lamps and commensurate efficiency in their installation are most favorable tokens of even more notable achievements in the electric lighting field in the future than in the past.

It is scarcely necessary to speak of the lines in which electric lighting has been principally extended. One of the chief certainly has been street lighting, both regular and decorative. The phenomenal extension of the latter to even small communities has been dwelt on in these columns on many occasions.

A decided increase in electric sign lighting, of every kind has taken place. Now one finds signs lighted in even the very small towns. Many of the large department stores are using electric signs inside to point out their most principal departments on the crowded floors. Many novel effects in sign lighting are being produced. The lighting of billboards by means of flashed colored lamps has rendered these even more conspicuous by night than by day.

Space does not permit more than a brief mention of some other of the developments in interior lighting aside from those already alluded to. One of these is the growing use of indirect lighting systems in restaurants, lecture halls, theater and church auditoriums, and such interiors where glare is particularly objectionable. The acknowledged success of most such installations has again directed attention to the possibilities of semi-indirect lighting in combining the advantages of both direct and indirect systems and eliminating the short comings of each.

In conclusion it is evident that all electric lighting has received a most decided impetus through the developments of more efficient and more adaptable electric lamps. These developments, together with the steadily reducing cost of electrical energy supplied by the large central stations, are making it economical to employ electric light in even the most modest home. All this is hastening the day when flame lamps of all kinds will be found in museums only and the electric light will reign supreme.

## Electric Railways.

While, in reviewing the progress of electric traction, it would be difficult to single out any extraordinary achievement, still the past year has witnessed the completion of two extremely important and significant undertakings that will have a tremendous influence on future electrifications.

The first is the Hoosac Tunnel electrification. In less than a year from the time that the New Haven interests took over the control of the Boston & Maine Railroad, the directors had authorized the change of motive power, all the engineering work was done and the construction work was completed under most difficult conditions without interruption to the operation of regular trains. On May 27 all trains, both passenger and freight, were operated by means of electric locomotives.

The Hoosac Tunnel is the longest railroad tunnel in the United States. The locomotives receive single-phase alternating current at 11,000 volts from overhead trolley wires. It is held that the electrification of the Hoosac Tunnel establishes, beyond peradventure of a doubt, the feasability of the application of the single-phase system to the most difficult physical situation, in that the Hoosac Tunnel provided extremely close clearances and very moist and at some points saturated conditions. The record for the tunnel under six months' operation is not a single insulator or line failure; practically perfect operation; complete relief from traffic congestion and the establishment of a flexible system, the extension of which, either in the easterly or westerly direction, can be accomplished without complication.

The second important undertaking is the yard construction for the 11,000-volt single-phase electrification of the Harlem Division of the New York, New Haven & Hartford Railroad. The plans for this development embody, it is thought, a very satisfactory solution of one of the difficult questions connected with this subject.

During the year further action was taken on reports submitted by the New York, New Haven & Hartford Railroad and the New York Central & Hudson River Railroad on the proposed electrification in the Boston metropolitan district. It is conceded that electrification is inevitable, although, as yet, no definite date has been set for beginning operations. In Chicago it is believed that slow but steady progress is being made in the matter of terminal electrification. The recent transaction between the Illinois Central Railroad and the city whereby the former agreed to turn over its lake-shore riparian rights to the city for parkings in return for other considerations, is thought to ultimately provide for electrification. The Association of Commerce Committee on Electrification has made two or three very excellent and comprehensive reports on the subject during the year.

Main-line electrification continues to progress. Of particular interest is the electrification, on the 1,200-volt direct-current system, of the Oakland, Berkeley and Alameda lines of the Southern Pacific Company in California. The total cost of the first stage of this work which was completed during the year was $10,500,000. In the East, the New York Central & Hudson River Railroad has extended its electric zone from Hastings, the former terminus, to Tarrytown, N. Y. The preliminary work from Tarrytown to Tarmon, the final terminus of the electric zone, is being pushed as rapidly as possible. Extensions of minor importance, but all indicating decided progress, have been made on several other trunk-line railroads.

In the field of interurban and suburban traffic many lines have been extended, new equipment has been added and better traveling facilities provided. The 1,200-volt direct-current system seems to be gaining in favor, and several notable installations have been made during the year. The Fort Dodge, Des Moines & Southern Railroad operating seventy miles of track on the 600-volt system has changed over to 1,200 volts. The Shore Line Electric Railway, of Connecticut, operating a mixed system of both 600 and 1,200-volt lines, has extended its line from Guilford to New Haven (Conn.), employing 1,200-volt direct current. The Piedmont Traction Company and the Oakland & Antioch Railroad, using 1,200 and 1,500-volt direct-current, respectively, have also made extensive additions to their lines.

Subway transit has received great impetus during the year 1911. In New York extensive additions to the Interborough and Brooklyn Rapid Transit systems have been authorized, and work is now under way. The subway situation in Chicago has at last assumed such proportions that definite action may be expected in the near future. Mayor Harrison has appointed a commission, composed of three prominent engineers, to investigate the subject and propose feasible plans for its building. A preliminary report has already been made. Plans for subways have also been proposed for Newark, N. J., and San Francisco, Cal.

In reviewing events transpiring in the street-railway field during the past year, there is little that can be termed startling either in the development of new practice, or in the lines of car equipment or operation. During the past year there has developed a keener interest in the standardization of apparatus and specifications. This desirable situation is credited to the good work done by the committees of the American Electric Railway Association, the meeting of which at Atlantic City was one of the important events of the year. In connection with associations, the establishment, on February 17, of the Illinois Electric Railway Association is of more than passing interest, as it indicates the increasing importance of electric railways in the state of Illinois.

Street-railway systems in many cities have been improved or plans made for their ultimate improvement. The rehabilitation of the Chicago systems which has been progressing for four years is practically complete. An engineering feature of considerable importance in this connection was the reconstruction of three river tunnels under the Chicago River. Perhaps the most significant development of the year was the merger of the elevated lines of Chicago and the plans proposed for the consolidation of all the street and elevated lines having for its goal the unification of all traction properties in the city. In Pittsburgh, Cleveland, Los Angeles, Toledo and Providence, R. I., exhaustive studies were made of street-railway conditions and plans presented for improvements. A noteworthy feature in connection with both street and interurban-railway operation for the past year has been the strenuous campaigns carried on to reduce the number of service accidents.

Gasoline-electric cars have been further developed during the year, and the order from the St. Louis & San Francisco Railroad Company for six cars of this type is an indication of the increasing favor with which they are being received. A total of about thirty cars of this type were sold during the year.

The storage-battery car received an added impetus during the year, the Third Avenue Railroad of New York adding to its present equipment thirty-five cars of this type for operation on cross-town lines. This makes a total of sixty-five cars in operation on this line. Several railroads have also adopted the storage-battery car for belt-line service.

In concluding the review of electric railways, mention should be made of the marked increase in the use of electric block signals on interurban and trunk lines. During the year the total mileage so equipped increased over 100 per cent.

## Electrochemistry and Batteries.

The electric refining of steel has become established as an industry and each year shows advances in its application. While the first use of the electric steel furnace indicated the displacement of the crucible steel process, more recent developments indicate that it may also displace the open-hearth method, at least in certain cases. Not only are tool steel and other special alloys made to advantage in the electric furnace, but this furnace is also being used in refining the ordinary grades of steel and for making steel castings.

Extensive experiments carried on at Trollhättan, Sweden, have demonstrated the possibility of the electric-furnace reduction of iron ores upon an industrial scale. The technical possibility of this process was demonstrated in Canada several years ago and the recent experiments at Trollhättan assure the establishment of a permanent industry. This method is especially suitable in cases where coal is scarce, as the amount of carbon necessary to reduce the iron is much less than that required by the blast furnace, where it must also perform the function of fuel. The method is also peculiarly adapted to the reduction of the titaniferous ores, which are so plentiful in Canada, and in the Evans-Stansfield furnace the ore is reduced and the metal refined to steel in a single process. Extensive experiments have also been carried on with the Noble furnace in California with satisfactory results. An output of five tons per kilowatt-year has been obtained in Sweden.

Application of the electric furnace to other branches of metallurgy makes continued progress. While difficulties are met in many instances, for instance in the zinc furnace and in the making of spelter, progress is continually being made and the outlook is hopeful for ultimate success.

The design of the electric furnace is receiving closer attention along scientific lines, and economies in operation are to be expected from more careful designs in accordance with these principles. Several new types of furnace have been designed during the year, the most notable of which perhaps is that invented by Hering, in which circulation is secured through the action of internal forces on the conducting material. This furnace is of the resistor type. The success with which the Hiorth furnace has met in Norway has led to the design of a much larger furnace upon the same lines. The tendency is generally toward the construction of furnaces of larger capacity. The use of electrodes whose sections are connected by screw joints has proven successful and results in a great economy in electrode material. The Groenwall furnace is another new type which has shown successful operation.

In the fixation of atmospheric nitrogen both the Schoenherr and the Birkeland-Eyde processes are showing successful results, each having its advantages under particular conditions of operation. For small installations the Schoenherr process seems preferable, but for utilizing large quantities of power the Birkeland-Eyde method is found to be superior.

The Digby electrolizer has simplified the production of hypoclorite solution.

The purification of water supplies by means of ozone is being widely extended. Plants for this purpose have been put in operation in St. Petersburg and in Paris, and the method is now in use in a large number of European cities. The ozone is produced by means of a high-frequency discharge at high voltage in a current of air.

The electrolytic system of amalgamating gold ores has met with favor, and its extensive application may be looked for in the near future.

The electrically fused alumina, known commercially as alundum, has been developed as a refractory material having high electrical resistance, and is consequently of advantage in electric furnace work. This material can now be furnished without a glaze, nonporous and capable of standing a temperature of 1,700 degrees centigrade. The metals tungsten and molybdenum, which are now available in a ductile condition and which have very high melting points, have been applied as heating elements in resistor furnaces.

While a number of patents have been taken out for storage batteries, no industrial developments have been noted in connection with them. The Ironclad Exide battery, which was perfected last year, has come into extensive commercial use, and is proving its advantages in the way of ruggedness, durability and capacity in commercial service. The use of electric vehicles has been greatly extended and this type of automobile has invaded the field of the touring car. The use of the storage battery on electric railways is increasing largely, due to the success of the modern form of Edison battery.

Several primary cells have been brought forward during the year, the most notable of which is the Benkoe cell. This cell uses a porous carbon electrode, thereby reducing the polarization to a small and constant quantity.

## Prime Movers.

Until our present methods of generating electricity are radically revolutionized, the developments in prime movers will remain of keen interest to electrical men. The year 1910 furnished several important developments in this line, chiefly in steam turbines.

These machines are coming rapidly to the lead of steam-driven prime movers. The growing uses of electricity, in the generation of which turbo-generators are particularly serviceable, as well as the replacement of steam engines in other than electric generating plants, have resulted in an almost extraordinary development of steam-turbine use in all classes of these machines. It has been estimated that the aggregate rating of the steam turbines now in service is upwards of 20,000,000 horse-power, most of which has been installed in the last few years. Only one incident in the passing of the steam engine need be mentioned. A few months ago the famous Corliss engine, which was one of the wonders of the Centennial Exposition at Philadelphia in 1876, was sold for scrap.

One of the most striking developments in the past year was the successful completion and placing in service of the largest prime mover ever built. This is the 20,000-kilowatt vertical Curtis turbo-generator at the Waterside station of the New York Edison Company. Several similar units are going into this station and into the new Northwest station of the Commonwealth Edison Company, Chicago. Although this event is a great achievement of the turbo-building art, it has created but little furor. Further advances in capacity are contemplated. The prophecy has been made that within a few years the central-station interests in our largest cities will demand turbine units of 25,000-kilowatt rating and possibly even much greater.

The horizontal turbine has been preferred for all sizes except those over 10,000 kilowatts. The builders of horizontal machines stand ready, however, to build such units up to any desired capacity. Through the further development of a successful high-power reduction gear, the steam turbine has been adapted to the driving of large direct-current generators, something which had already been successfuly done with small machines of this type. There has been a tendency to employ higher speeds in some types of large steam turbines, 1,500 and 1,800 revolution-per-minute machines being now built up to the 10,000-kilowatt size.

The economies in both fixed and operating costs attainable by the use of very large turbine-driven generating sets are being sought by many of the largest elec-

tric-railway systems in our principal cities, such as the Boston Elevated Railway Company, for example. This company is installing two 15,000-kilowatt turbo-generators in a station that will ultimately contain over 100,000 kilowatts in similar machines. The reliability of these units is so high that it is perfectly safe to concentrate all the power production in one highly economical station which supplies a number of rotary-converter substations to take the place of former scattered engine-driven power plants.

Another field for the steam turbine is being developed as the result of the perfection of the so-called "bleeder" type of turbine. This has an automatic valve between the intermediate and low-pressure stages which permits some steam to be diverted or "bled" from the turbine for auxiliary purposes or heating systems. This makes a very economical and flexible unit for combined electric and central heating plants.

Very much more extensive use is being made of small re-entry type impulse turbines in size from 1 to 300 kilowatts for operating power-plant auxiliaries, such as exciters and centrifugal pumps. Frequently such machines are used for driving the main generating units in small isolated plants.

While there have been no radical changes in gas-engine practice, there has been development in the simplification of design and the utilization of higher-grade materials in construction. Cylinder cracks have been almost eleminated. The number of parts has been reduced and repairs thereby facilitated. The maximum rating of these machines still remains about 4,000 horsepower.

In oil engines steady improvement is being made, aiming at refinements in design and reduction in weight without sacrificing ruggedness of construction. Oil engines have been limited in size to 500 horsepower, which has confined their usefulness to the smaller plants and where cheap fuel oil is available.

The extension of the use of internal-combustion engines in the electrical industry has been by no means proportionate to the rapid extension of steam and hydraulic turbines. Among the reasons for this are the much higher investment cost per kilowatt of rating and the small limits both of capacity and overload that the gas and oil engines are capable of.

In the line of hydraulic turbines and water wheels no radical developments can be reported for the past year. The prevailing general depression has had a detrimental effect on many hydroelectric projects, so that the number of hydraulic units installed has not been as great as usual. The manufacturers, however, have improved the lull by devoting attention to details of design, particularly of the governing mechanism. In hydroelectric practice, as in steam-driven stations, there is a constant tendency to employ larger units if the size of the development will at all permit this to be done. The Pacific Coast Power Company is installing Francis turbines of 20,400 horsepower rating. Similar units are also going into other plants.

Of other than the now customary sources of power there has been but slow development, though there is bound to be much more as the cost of fuel increases and the available water-power sites decrease in number. As an aid to making wind power more serviceable in country places, the patent granted to the late Caryl D. Haskins is of interest. It provides for an automatic device to start up an internal-combustion engine when the wind velocity is too low and to shut down the engine again when the wind picks up.

Before concluding this review of prime movers an important development in steam boilers must be mentioned. This refers to the very powerful and compact boiler units installed by the Detroit Edison Company. On the old conservative system of rating, these boilers have a capacity of 2,365 boiler horsepower; they have carried a normal load of 6,000 kilowatts and during peak service 7,000 to 8,000 kilowatts. They have a high efficiency and represent a further reduction of fixed and operating charges in large central stations that is bound to lower the rates and therefore bring much new business to them.

## General Survey and Manufacturing Statistics.

In the foregoing, practically all points respecting specific developments have been covered. So far as electrical machinery is concerned, however, there is a good deal in the way of progress to chronicle. Industrial application of electrical energy for lighting, heating and power, as well as domestic utilization, have greatly increased the demand for material of this character, and the widespread advertising carried on by the big manufacturers along national lines has so popularized electrical apparatus in both the home and the factory that the coming year should be a banner one for countless varieties of current-consuming devices. The fan season of the year past has been of large proportions; a torrid wave holding the entire country in its grip for practically two months created an unprecedented demand for fan motors wherever electrical energy was available.

One of the most satisfactory developments of the year was the placing on the market of several new types of single-phase machines, all of which have the characteristic of producing leading power-factor under certain load conditions. Single-phase constant-speed motors are now available which have a load characteristic similar to the well known single-phase induction motor, with the addition of a commutator over which a part of the working current flows. A second set of brushes serves the purpose of improving the power-factor, and the armature also has a squirrel-cage winding which carries the greatest part of the working current. Another form of single-phase motor, for adjustable speed, has but one winding, and two pair of brushes for each pole pair. Both sets of brushes can be used for regulating the speed. One set of brushes is also used for compensating the motor. This type has been built in speed ranges up to 1:3, and if adjusted for a certain speed keeps this speed nearly constant independent of load. Single-phase direct-current rotary converters have been developed, filling a long-felt want. The machine works in its principle the same as any converter; however certain improvements have been made which secure an absolute sparkless operation of the brushes. This type of converter has been furthermore provided with a powerful damping winding which makes hunting impossible.

The extensive adaptation of pressed and rolled steel for electric motor parts is an important development both in design and shop practice.

The electric furnace for the refining of steel is attracting more attention, and electricity is playing a more important part in this phase of the steel industry. In this connection, also, there has been a very satisfactory working out of motor problems for heavy steel-mill work, for reversing tables and rolls, with a consequent improvement in design and increase in capacity of rheostats, switches and circuit-breakers.

In electric heating there has been a steady advance both in design and number of applications. Particularly in the direction of electrical cooking apparatus, of both commercial and domestic nature, has the advance been marked. The thermal storage electric range designed by William Stanley is one of the important developments of the year in this respect. The principal commercial applications which have shown the largest advance during the past twelve months are commercial cooking, made possible by the improved design of the larger pieces of apparatus for hotel and restaurant kitchens, namely, the range, broiler, large toasters, etc. Commercial baking is being encouraged by a number of central stations giving special night

rates to bakers. The United States Government now requires electric ranges and ovens in the galleys of all new battleships. In the line of industrial electric heating many new applications have been made and improvements in old applications of electric heating, in shoe manufacturing, hosiery manufacturing, publication work, including newspapers, etc. In the household the new electric disk-stove ranges are becoming popular. The "fireless cooker" idea is being worked out in the twenty-four hour storage cooker ranger in which a small amount of current will be used continuously every hour in the day.

There has been a great increase in production of motors for electric vehicle service, for baggage trucks, and storage battery cars. Improvements in design and selection of material of construction are producing a more compact motor and control equipment having high efficiency combined with minimum weight per unit of output.

High-tension developments have been carried to 140,000 volts and some systems are at present being installed at this voltage. In connection with this development roof entrance bushings have received considerable attention and great success has been obtained with what is known as the filled type of bushing.

The demand for outdoor apparatus for long-distance transmission line has resulted in the placing in service outdoor-type oil circuit-breakers for voltages from 40,000 to 110,000. These breakers, in connection with outdoor transformers, eliminate the necessity of a substation where it is desired to supply moderate demands for energy from high-tension lines. There has also been developed a combination outdoor disconnecting switch and fuse for voltage as high as 44,000.

High-voltage outdoor transformers have recently been built in capacities of 1,000 kilovolt-amperes and 500 kilovolt-amperes for 110,000-volt service.

A notable achievement during the past year was the construction of two 750,000-volt testing transformers. One of these transformers has been operated up to 900,000 volts.

In heavy cable construction there have been no radical changes. There has possibly been more demand for submarine cable, both of steel-tape armor and wire armor types. A project to run a large electric light and power cable across San Francisco Bay has been consummated during the year and over 20,000 feet of cable shipped for this purpose. There have been inquiries for cables for pressures from 30,000 to 60,000 volts during the year, and cables for a working pressure of 40,000 volts have been made and placed in operation.

The table herewith, giving an estimate of the value of electrical and auxiliary manufactures of the United States, has been compiled from data submitted by the leading manufacturers devoted to these products. To all of those thus contributing to the preparation of this information we extend our most sincere expressions of appreciation.

| ARTICLES. | For the Year— | | | | |
|---|---|---|---|---|---|
| | 1907 | 1908 | 1909 | 1910 | 1911 |
| Arc lamps and appurtenances | 3,150,000 | $ 2,000,000 | $ 2,500,000 | $ 2,750,000 | $ 3,000,000 |
| Auxiliaries, steam, for electrical installations, such as pumps, condensers, separators, feed-water heaters, injectors, piping, etc | 3,100,000 | 2,000,000 | 3,000,000 | 3,350,000 | 3,000,000 |
| Bells, buzzers, push-buttons, call-boxes, annunciators | 1,300,000 | 1,300,000 | 1,500,000 | 2,000,000 | 2,000,000 |
| Belting used in electrical plants | 425,000 | 200,000 | 200,000 | 200,000 | 250,000 |
| Boilers for electrical plants (water-tube) | 6,000,000 | 4,000,000 | 5,000,000 | 5,500,000 | 4,800,000 |
| Boilers for electrical plants (other than water-tube) | 2,500,000 | 1,500,000 | 1,750,000 | 2,500,000 | 3,000,000 |
| Cables, underground, aerial and submarine | 18,000,000 | 10,000,000 | 11,000,000 | 12,500,000 | 13,000,000 |
| Carbons for lamps, batteries, brushes or other electrical purposes | 3,500,000 | 2,250,000 | 4,000,000 | 4,500,000 | 5,000,000 |
| Cars and trucks for electric railways | 8,650,000 | 6,900,000 | 7,500,000 | 5,000,000 | 6,500,000 |
| Castings, copper, and other metals, used by electrical manufacturers | ..... | 300,000 | 500,000 | 600,000 | 650,000 |
| Circuit-breakers | 1,675,000 | 920,000 | 1,200,000 | 1,350,000 | 2,000,000 |
| Conduits (underground) and similar material | 1,700,000 | 500,000 | 700,000 | 850,000 | 750,000 |
| Conveyors, coal and ash, used in electrical plants | 775,000 | 400,000 | 425,000 | 500,000 | 600,000 |
| Cranes and hoists, electrically operated | 5,850,000 | 3,500,000 | 4,500,000 | 6,000,000 | 4,500,000 |
| Dynamos and motors, including parts of machines, boosters, balancers, rotary converters, motor-generators, etc., and all motor applications, such as in automobiles, not specifically enumerated in this list | 62,500,000 | 50,000,000 | 70,000,000 | 75,000,000 | 80,000,000 |
| Electroplating and other electrolytic apparatus not elsewhere specified | 1,000,000 | 1,000,000 | 1,100,000 | 1,000,000 | 1,000,000 |
| Electrostatic machines, induction coils, medical sets, etc | 500,000 | 500,000 | 600,000 | 750,000 | 700,000 |
| Elevators, electric (mechanism only) | 4,675,000 | 1,600,000 | 2,000,000 | 2,600,000 | 2,500,000 |
| Engines, gas or gasoline or oil, used to drive electrical machinery | 4,300,000 | 6,000,000 | 9,000,000 | 9,000,000 | 12,000,000 |
| Engines, steam (reciprocating), used to drive electrical machinery | 12,000,000 | 9,000,000 | 12,000,000 | 12,000,000 | 10,000,000 |
| Fans, electrically operated and direct-connected | 1,850,000 | 1,100,000 | 1,500,000 | 2,000,000 | 2,250,000 |
| Fire-alarm apparatus, also burglar alarms, crossing indicators, etc. | 1,850,000 | 900,000 | 1,000,000 | 800,000 | 900,000 |
| Fixtures for electric lighting | 7,500,000 | 8,000,000 | 10,000,000 | 11,000,000 | 12,500,000 |
| Fuses | 1,200,000 | 750,000 | 1,000,000 | 1,150,000 | 1,500,000 |
| Glassware, electrical | 1,450,000 | 2,000,000 | 2,500,000 | 3,000,000 | 3,500,000 |
| Heating and cooking apparatus, electrical | 1,100,000 | 1,000,000 | 1,500,000 | 2,000,000 | 2,500,000 |
| Incandescent lamps (carbon or metallic filaments) | 10,000,000 | 11,000,000 | 14,000,000 | 17,500,000 | 19,000,000 |
| Instruments for measurement and meters of all kinds; also ground detectors, scientific and laboratory apparatus, photometers, Leyden jars, X-ray outfits, etc | 5,000,000 | 2,000,000 | 2,250,000 | 2,400,000 | 2,400,000 |
| Insulating material, fiber, tape, etc | 2,850,000 | 1,700,000 | 2,500,000 | 2,700,000 | 3,000,000 |
| Insulators (glass and porcelain) | 2,000,000 | 1,350,000 | 2,300,000 | 2,560,000 | 2,500,000 |
| Interior wiring supplies, as tubing, interior conduit, molding, junction boxes, rosettes, outlet boxes, etc | 3,500,000 | 2,220,000 | 3,000,000 | 2,500,000 | 4,000,000 |
| Lightning arresters | 500,000 | 275,000 | 400,000 | 500,000 | 500,000 |
| Mercury-vapor lamps | 450,000 | 300,000 | 500,000 | 700,000 | 800,000 |
| Nernst lamps | 950,000 | 1,000,000 | 1,000,000 | 750,000 | 750,000 |
| Poles and wire towers, cross-arms, brackets and pins | 5,125,000 | 3,500,000 | 4,000,000 | 5,000,000 | 5,500,000 |
| Primary batteries | 1,800,000 | 1,000,000 | 2,000,000 | 2,500,000 | 2,700,000 |
| Railway supplies, electric, such as trolleys and other contact devices, strain insulators, cross-overs, rail-bonds, etc | 4,000,000 | 2,200,000 | 3,000,000 | 3,250,000 | 5,000,000 |
| Rheostats, car controllers, motor starters, etc | 4,750,000 | 2,600,000 | 4,700,000 | 5,000,000 | 5,000,000 |
| Shafting, pulleys, clutches, etc., used in electrical generating plants | 725,000 | 400,000 | 500,000 | 500,000 | 750,000 |
| Signs, electric | ..... | 1,000,000 | 1,250,000 | 1,500,000 | 2,000,000 |
| Sockets, switches, cut-outs | 5,500,000 | 4,000,000 | 5,000,000 | 6,000,000 | 6,000,000 |
| Steam turbines used to drive electrical machinery | 8,000,000 | 7,000,000 | 12,000,000 | 14,000,000 | 10,000,000 |
| Storage batteries, including those used in automobiles | 6,200,000 | 5,500,000 | 6,600,000 | 6,750,000 | 10,000,000 |
| Telegraph instruments and apparatus | 475,000 | 400,000 | 600,000 | 500,000 | 600,000 |
| Telephones, telephone switchboards and distinctively telephonic apparatus | 21,000,000 | 15,000,000 | 15,000,000 | 20,000,000 | 20,000,000 |
| Third rail for electric railways | 750,000 | ..... | 1,000,000 | 1,000,000 | 1,000,000 |
| Transformers, stationary | 5,500,000 | 3,025,000 | 4,000,000 | 4,500,000 | 5,000,000 |
| Water-wheels, used to drive electrical machinery | 3,100,000 | 3,000,000 | 4,000,000 | 3,500,000 | 3,000,000* |
| Welding apparatus, electric | 120,000 | ..... | 150,000 | 200,000 | 200,000 |
| Wire, bare | 27,000,000 | 18,000,000 | 22,000,000 | 24,000,000 | 25,000,000 |
| Wire, rubber-covered | 16,500,000 | 11,000,000 | 12,000,000 | 15,000,000 | 15,000,000 |
| Wire, weatherproof | 15,000,000 | 9,000,000 | 10,000,000 | 12,000,000 | 13,000,000 |
| Wire, all other electrical | 4,150,000 | 4,000,000 | 5,000,000 | 5,000,000 | 5,000,000 |
| Wireless apparatus | 425,000 | 500,000 | 500,000 | 350,000 | 400,000 |
| Miscellaneous, including switchboard frames and panels, signs and flashers, automatic stokers for electrical plants, wire guards, electrical tools and toys, projectors, solenoids, igniters for gas engines, water-wheel governors for hydroelectric plants, voltage regulators, electric drills, commutator compounds, lamp adjusters, shade holders, etc | 4,000,000 | ..... | 10,000,000 | 10,000,000 | 15,000,000 |

# Electrical Progress in Great Britain During 1911.

By Albert H. Bridge.

While the year 1911 has not witnessed any electrical achievements in the United Kingdom which can fairly be described as sensational, it is a far more satisfactory period to write about than we have had for some years past. It has abounded with interest for particular reasons, has shown noteworthy advance in practically every department of electrical application, there has been less grumbling about the state of the industry, and the outlook in general is bright.

Electricity supply authorities in most towns of any importance have resumed the ordering of generating plant extensions, which was somewhat seriously suspended in several previous years owing to the adverse effect of the metal-filament lamp. The following cases will illustrate the course such matters have been taking consequent upon growing demand for both light and power. Bath municipality added an 800-horsepower Diesel engine and 450-kilowatt dynamo which would result in a net saving of $7,800 per annum, thus paying the cost in five years. Burnley took out old equipment, substituting a 1,500-kilowatt turbine plant with tandem generators. South Shields abandoned some old small sets and proceeded to install a Rateau turbine of 2,500 kilowatts, direct coupled to one 1,000-kilowatt direct-current generator and one 1,100-kilowatt alternating-current generator. Worcester proceeded with a scheme substituting three-phase for single-phase alternating-current supply. The Federated Potteries scheme is going ahead and $300,000 is being spent upon extension of the plant at one station. The equipment is three-phase extra-high tension and will meet the future requirements of the district. Two 1,500-kilowatt turbine sets have also been ordered. The Metropolitan Electric Supply Company (London) brought into use for the first time in England the high-tension direct-current system for supplying Southall and Hanwell, by which the use of very small cable over practically any distance will be practicable. At the commencement a tension of 3,000 volts will be used, which will be quite sufficient for the first year or two, but as the district develops it can be increased up to 100,000 without spending anything more on cable.

Liverpool has decided to install at Lister Drive (No. 1) station two 2,000-kilowatt British Westinghouse direct-current turbo-generators, and two 3,500-kilowatt turbo-alternators. This is part of an improvement scheme which involves getting rid of a number of existing sets and adding condensing apparatus. The works are costing $500,000. It has been commented upon here with some surprise on the part of the municipalities, that two of the engines which are to be scrapped cost $350,000 ten or twelve years ago, but will now only fetch $20,000, but those who have watched matters from the electrical industry and engineering side have learned the lesson already. Derby municipality, for electricity extensions, has adopted three phase in place of single phase. Saint Helens added a 1,000-kilowatt turbo-alternator generating at 6,600 volts. At Leeds the municipal tramway and electric supply departments came to the conclusion that they should convert tramway generating and other apparatus from twenty-five to fifty cycles in order that mutual assistance might be possible. Otherwise the electricity department's plant would have had to be extended. In Leeds, further, it was decided that the power supply having been now developed (total demand 15,000 horsepower), the advantageous use of the maximum-demand system of charging power users was to some extent ceasing. Therefore it was suspended with a view to giving everyone a power supply at a price not exceeding the lowest price then charged.

Glasgow electricity works brought its coal consumption per unit down from 4.15 pounds to 3.47 pounds per unit generated, saving 14,910 tons of coal per annum. Its tramway department has sent to the Continent and elsewhere to investigate the practical working merits of different types of turbine plants, and it has now ordered for Pinkston generating station a Curtis pure impulse type with British Thompson-Houston alternator, and a Richardson-Westgarth impulse-reaction type and Brown-Boveri alternator. As there is already a pure reaction turbine station at work at Pinkston, the working of the three will be studied so that guidance may be gained and applied to Glasgow's big power station when it is installed.

The Neasden (Metropolitan Railway) power station has its new Westinghouse turbine plant in operation. Lot's Road has added its eighth Parsons turbine during the year, and its annual output is now about 140,000,000 kilowatt-hours, but as the year closes proposals are announced which may mean that various existing supply authorities will enter into arrangements to buy their future additional needs from the Lot's Road station. In South Wales, the Treforest Consumers Supply Company has added a second 3,000-kilowatt turbine set. The Clyde Valley Power Company has added a 5,000-kilowatt turbo-alternator at Motherwell power station, making the total capacity of its two stations 22,600 kilowatts.

An interesting contract was entered into by the London Electric Supply Corporation, under which it will supply the London, Brighton & South Coast Railway Company for seventeen years with 30,000,000 units per annum for operating its single-phase railroad. For this purpose it is now erecting a 14,000-horsepower turbine-driven plant. The charge per unit under this contract will be on a sliding scale—.85 pence maximum, .50 pence minimum.

The foregoing will suffice to indicate how general has been the extension development of the year, how largely the question of rearrangement of stations and systems ranks in the work of electricity supply men today, how prominently the investigation of different turbine types has been in the problems of the engineer, and taken together with the other work of which it is representative, it is an ample explanation for the greater activity recently observed in British factories. The Diesel engine is also rapidly gaining ground and has been put into a number of stations.

The development in the electric street-lighting department has been very marked. Gas and old types of electric arc lamps have continued to give way in many towns, both large and small, before the metal-filament and the flame-arc lamps. In London two long controversies have been settled by the street-lighting contracts being equally divided between the gas suppliers and the electric-light companies—at Holborn and the City of London. Poplar Council has taken in hand a complete street-lighting rearrangement scheme taking full advantage of the latest devices. Glasgow has substituted flame arcs for an older type in a number of streets with such a result that the change has been largely extended there since. Shoreditch is replacing its street gas lamps by metal-filament lamps. Hampstead is to spend $75,000 upon the conversion of the remaining gas lamps to electric.

In respect of electric tramways little need be said. Torquay abandoned

its eleven miles of surface-contact system and now has trolley; Bourneworth abandoned its conduit section and made its entire system uniform with overhead trolley. A few minor tramway extensions were carried out, but greater interest has centered in the railless electric traction system. Leeds and Bradford opened their service of cars in June, and three months later Bradford had before it a scheme for a fifteen-mile extension. Dundee is proceeding at the moment of writing with a trackless-trolley line and the cars are ordered.

In regard to railways the question of electrifying the line from London to Brighton has been under consideration, but the company is at present limiting actual operations to the conversion of the lines near London. One extension of this single-phase system has been opened during the year, and another is now in hand. The Great Western Railway gave out orders for a petrol-electric rail motor coach for branch-line working. The Central London tube-line extension to Liverpool Street is making headway for completion in June next. The Metropolitan District and other London electric lines have been further improving their services. The decision to electrify the East London Railway has at last been reached. The London & North Western added to the interest of the year considerably by its announcement, late in 1911, of its intention to carry out at once a substantial electrification scheme between London and Watford.

The cinematograph popularity has not waned, and electrical equipments for these theaters have occupied many contractors. The electrical exhibition at Olympia in September and October was an event of important industrial interest upon which some 250 firms centered their attention as exhibitors. The reorganization of the Electrical Manufacturers' Association was under prominent notice at the time of this event, and great hopes are entertained by some regarding the benefits that reorganization is going to bring to the members of the industry. The Coronation celebrations in June gave electricity an admirable opportunity for displaying its merits to the full. Electrical men have every reason to look back upon the result with the completest satisfaction.

The Textile Institute and the Institution of Electrical Engineers have cooperated in the formation of a joint committee to fully investigate the applications of electricity in textile mills at home, in America and on the Continent. Experiments, it is said, are to be carried out, so that a report of real value may be produced. Gratifying progress has been made in this department of electrical application, and especially has there been advance in the use of the individual drive in large mills in Lancashire, Yorkshire and Scotland. Orders for thousands of motors for these purposes are in hand.

The National Telephone Company's system with its 17,000 staff and employees ceased to become a private concern on December 31 and important developments may be expected before long. Some interest has been taken during the year in automatic telephone exchanges and the Post Office authorities are experimenting. A company has been launched to manufacture automatic telephone apparatus, etc., under the Strowger patents, in Liverpool, in expectation of a big demand from the Post Office. An event of English interest was the laying of the Anglo-Belgian loaded telephone cable (fifty knots in length) from Saint Margaret's Bay to La Panne by the ship *Faraday* in August, and great has been the advantage in the quality of long-distance talking as a result of this undertaking.

In most parts of the Kingdom there has been continued effort to familiarize the public with the manifold domestic applications of electricity. In addition to the big exhibition held at Olympia, there were a number of exhibitions in different localities, organized both as popular and educational attractions, by electricity suppliers. The appreciation of the value of such events seems to be growing. In some districts the responsible authorities have contented themselves with the opening of small showrooms of a more or less permanent nature. In London the Westminster Company established a large and effective showroom where all kinds of electric illumination systems, household appliances, and a finely equipped electric kitchen, are admirably displayed.

Electricity suppliers have been endeavoring to encourage the cooking and heating business by rearranging their rates. They have also been engaged considering charges for other classes of business to keep pace with changing conditions. At Brighton where the possibilities for electric power are small, but those for heating and cooking ought to be good, there has been a most successful exhibition held. The happy idea was adopted of arranging this event simultaneously with the inauguration of a new system of charging, and both matters soon became well known. The new system is a charge of one penny per unit for current for power, heating and cooking at premises fitted with a lighting installation of not less than six sixteen-candlepower lamps.

# The Year's Electrical Developments in Continental Europe.

By C. L. Durand.

One of the fields in which there is considerable progress to be noted during the past year is that of hydraulic power. A striking example is the new project for securing a supply of current for the city of Paris from the Rhone River. This calls for a hydraulic plant of 200,000 horsepower and it lies over 300 miles from the city.

A combined hydraulic and steam plant in southern France was opened this year, and it presents considerable interest. It is situated on the Dordogne River and works upon an extensive power network in the region of Bordeaux. The barrage lies directly against the turbine house and is of the lifting-gate type, this being needed to meet the heavy freshet.

In Austria, the Danube is to be called upon for a large supply of power. One plant at Zengg will be laid out for 80,000 horsepower and it will be used for the town of Fiume and the Adriatic coast. A second plant will be erected on the river for the electric lighting of Pressburg, and it will furnish 40,000 horsepower. We also note a large hydraulic plant to be erected in Germany to furnish current for the Bavarian railroads. It is to lie on the Isar River and will give 25,000 horsepower. The city of Turin now receives current from a plant on the Dora Riparia stream, containing four Pelton wheels of 5,000 horsepower size, with three-phase alternators. The power line is operated at 50,000 volts. Milan is changing its lighting from gas to electricity, and the current is to come from five water-power plants in the Lombardy region at about 100 miles distance.

It is also in the field of electric traction and especially upon trunk lines or suburban systems, that we find enterprises of large scope. Subways are on the increase in several of the leading capitals. A good example of suburban extension is the $30,000,000 project for changing over all the lines in the re-

gion west of Paris belonging to the State railroad.

A new section has been added to the Berlin subway and it connects the city with the important suburb of Schöneberg. The Siemens & Halske firm equipped the line. Work is being carried out on several new sections of the Paris subway. We should mention the project for the electrification of the Stadtbahn, the great suburban line crossing the center of Berlin. Although the cost is great ($30,000,000) it is likely that the undertaking will be carried out. The Vienna city council approved the plans for an extension of the suburban lines which will cost $20,000,000. Many of the outlying roads will be changed over and several city branches, among others two subways, will be built.

Traction matters are very active on trunk lines and standard-gauge sections. The Paris-Lyons-Mediterranean railroad is experimenting with a special type of single-phase electric locomotive designed by Engineer Anvert, and expects to equip a number of sections with the system. A 12,000-volt overhead wire is used. In the Pyrenees region about 300 miles of road are to be equipped on the 12,000-volt single-phase system. One of the leading electric railroads in the north of Italy runs from Genoa to Milan and Turin across the mountain region, and is used for transporting coal. It uses three-phase current at 3,000 volts and runs heavy electric locomotives of sixty-five tons adherent weight.

Quite a number of European firms are engaged in building steam turbines at present. Among these is the Oerlikon works near Zurich. Turbine alternator sets of 1,500 and 10,000 horsepower are now built, and two of the 10,000-horsepower sets are now installed in the Stockholm city plant. The units are designed to give three-phase current and deliver 6,000 volts. The Stockholm plant is thus increased considerably and has been otherwise extended by new boilers and improved coal-handling appliances. For other uses, the same works are building a new type of small turbine ranging from 10 up to 500 horsepower. It is useful for driving dynamos, pumps and other machines. A new type of steam turbine is being manufactured by the German Augsburg-Nürnberg works, and it has been installed in a number of plants. We note a 2,000-horsepower turbine-alternator at Gronau, Westphalia, and a 1,500-horsepower unit at the Ulm city plant.

The use of waste gases from coke furnaces for operating large gas engines up to 3,000 horsepower size for electric plants is coming into practice. As an example, we mention a new plant installed at the Eschweiler Mines by the Augsburg-Nürnberg company. Here are installed nine Nürnberg gas engine and three-phase alternator groups to a total of 15,000 horsepower. The largest size of engine used here is 2,800 horsepower. Another plant of the kind is erected in France at the Lens Mines, using three 1,000-horsepower engine groups with alternators built by the French Westinghouse Company.

As regards progress in wireless telegraphy, we note that the Eiffel Tower station at Paris is now commencing to operate, seeing that the aerial part of the plant is quite completed and a part of the apparatus is installed in the various rooms of the underground post. A wave-length of about 2,000 meters is used. Measures are being taken to install a Diesel oil engine group of 300 install a Diesel oil-engine group of 300 horsepower, along with apparatus which will enable the post to cover the distances for which it is intended. Major Ferrié is engaged on this work at present. It will be remembered that the Tower is 300 meters high. It is likely to be rivalled in the near future by the German station at Nauen, seeing that the mast tower is now increased from 100 to 200 meters height, and it is claimed that it already covers a range of 3,000 miles. After the Paris post, it now has the highest tower in Europe.

Capt. Brenot succeeded in sending messages from an aeroplane to the Eiffel Tower post when flving at 1,600-feet height and at distances varying from 25 to 35 miles. The new apparatus is very light, and weighs but 30 pounds. It needs, however, about 20 pounds of supporting pieces, which brings the weight up to 50 pounds. An aerial wire is unrolled when in flight, and it hangs down for 120 feet. The 50-horsepower gasoline motor of the aeroplane furnishes the power supply. On the present occasion the aeroplane carried the pilot and two other officers of the military corps.

The Mercadier-Magunna apparatus is one of the most recent in the field of multiplex telegraphy, and it was tested over a single wire from Paris to Lyons not long since. The vibratory method is used, and the sending instruments are tuning-fork vibrators each of which sends current of a different frequency. The receivers consist of vibrating metal disks acting as relays, and each is tuned to act as a selector for a certain pitch. A key on each transmitter allows of sending Morse signals in this way. In France it was used to work six Hughes printing telegraphs working by the relays. Direct current can pass on the line at the same time as the waves, and this allowed of working a Baudot quadruplex printer. In this way the capacity of a given wire is greatly increased.

The large ozone plant erected at St. Petersburg for water purifying is attracting considerable interest. It was carried out according to the plans of M. Otto, at the head of the French Compagnie d' Ozone, and the matter was treated between this firm and the city of St. Petersburg, also the Russian Siemens & Halske firm. The electric part of the plant has a number of steam-engine and alternator sets for three-phase, low-frequency, also a set of motor-generators which produce 500 cycles. This latter current goes to the ozone producers. From here the air charged with ozone is sent to the apparatus by which it is intimately mixed with the water so as to purify it.

Plants for producing nitrogen from the air continue to increase within the present year. One of these is a new plant in France at La Roche, and it uses the Pauling process. Each furnace has two arcs in series and there are three furnaces in a group, working on 6,000-volt, 50-cycle three-phase current. Each furnace uses one phase. Compressed and heated air is sent to the furnaces and nitrous oxide is produced. This is then passed in water absorption towers. In Germany, nitric acid is to be produced on a large scale in the Höhn plant in Hesse-Nassau. For this purpose and also for operating a local network, 10,000-volt alternators are to be installed.

Very pure electrolytic sheet iron is now made by Engineer F. Fischer, of Berlin, on an improved process. The problem was recognized as a difficult one, but is now claimed to be successfully solved. Iron is deposited on the electrodes in the form of sheets which are durable and can be well worked.

Professor Urbain, of the Paris University, has been working upon a new arc lamp which promises to be of considerable interest. In this lamp the arc is found between tungsten and mercury, and the advantage is that the tungsten does not melt and the lamp is durable. The anode is formed of tungsten and the cathode of mercury, the whole being inclosed in a vacuum or inert gas, and the electrodes are spaced about three-sixteenths of an inch apart. One point is that the efficiency of such a lamp is very high, and Professor Urbain states that this is about 0.45 watt per candlepower.

In the way of tube lamps, the neon tubes are among the newest. M. Georges Claude now perfects the lamp so that it is much better than heretofore and is adapted to be used in practice. The lamps are in the shape of long tubes like the Moore light. A point to be noted is that M. Claude makes the tubes at the factory in standard lengths of 15 feet or more and these can be taken to the spot to be set up or to replace others.

# Power Requirements of the Modern Laundry.

## A Study of the Opportunities for Electric Drive—The Motor Characteristics, Applications, Features of Control—Power Data of Typical Installations.

There is no industry to which electricity is better adapted and to which it has been until recently so infrequently applied as the steam laundry. It is not generally recognized by laundry proprietors and central-station managers and their power solicitors that the time-honored steam drive can be economically and satisfactorily displaced occasionally by group and more frequently by individual electric drive, and yet in the fast increasing instances in which electricity furnishes the motive power, laundry proprietors have become enthusiastic over the increased production and greatly improved results accomplished.

From the standpoint of the electrical industry as a whole the laundry field offers exceedingly promising latent possibilities. One or more steam laundries offering opportunity for the application of electric drive will be found in practically every town or city. The magnitude of the industry is best indicated by the United States census figures recently made public which show that in 1909 there were 5,196 power laundries in the United States doing an annual business of $104,680,000. The primary power used was 123,377 horsepower. It is estimated that for 1911 these figures will have increased fully twenty per cent.

### General Advantages.

The essential feature in every laundry is cleanliness, and as this fact is universally appreciated by laundrymen, any application which makes possible the elimination of dirt will receive their most careful consideration. Where belts and shafts are depended upon for the transmission of power, the dirt problem is very serious. Dirt not only interferes with the production of the best grade of work, but greatly decreases the possible output and increases the work which has to be rehandled. The discharge of dirt, dust and lint which always accompanies the use of belts is bound to produce damaging results. In addition to this, there is always leakage of oil at the bearings and shaft hangers, and though drip pans may overcome this difficulty to some extent, the ever-present danger of overflow is hard to avoid. Dirt is bad at any stage, but its results are most keenly felt in the drying, starching and ironing rooms; there a mishap requires the repetition of practically a whole cycle of operations, necessitating a considerable loss of time and labor, and incurring considerable expense and additional equipment. Here one of the strong arguments in favor of motor drive is clearly brought out. For instance, for reversing ironing machines a simple switch may be used if an invidual motor is applied, and as all moving parts are covered the discharge of dirt is entirely avoided, and belt slips eliminated.

Another essential feature in every laundry is light. Aside from the fact that poor light is detrimental to the health of the employees, it has a direct bearing on the financial side of the question. Belts and shafting are sure to obstruct the illumination to a considerable extent, causing shadows which make it difficult to detect soiled portions of the clothes. Individual motor drive makes shafting unnecessary, and hence its advantage here is obvious.

One of the most vital questions with which laundry proprietors have to deal with is that of labor; particularly in the smaller cities does this question assume alarming proportions and any system which will improve the physical conditions, especially those which prevail during the summer months, is worthy of careful consideration. The reduction in noise, improvement in light, and the absence of the dirt nuisance obtained with electric drive are sure to produce desirable results. Also the absence of belting allows of much better ventilation.

Another feature in connection with electric drive that, although well known, cannot be emphasized too strongly, is the absence of breakdown troubles. Experience has shown that where motor drive is employed the delays, occurring so frequently in steam plants, are practically eliminated. The necessary expenditures for repairs is very much less than where belts and shafts are used.

Considered from the central-station standpoint, all laundries offer possibilities for profitable business. In many instances large laundries requiring a considerable amount of steam can, with a well designed and efficient plant, generate their own current at a cost too low to admit of central-station competition. Of course if these laundries are so situated that it would be feasible for the central-station company to supply both steam and electric energy the above condition would not obtain.

There are, however, a great number of laundries that can economically purchase current for all of their requirements, generating steam for heating and hot water from their own boilers. The number of laundries coming under this classification could be considerably increased by intelligent soliciting from central stations.

Laundries generating their own current or requiring such a large amount of steam that current cannot be profitably purchased from the central station offer possibilities for good business for sign lighting, over-time lighting, and for operating by motor drive laundry machines during certain portions of the day or week. The laundry industry is making rapid strides. Plant increases are frequent and, in this connection, the central station can furnish energy for operating additional machines, this being the entering wedge that opens up the way to the ultimate supply of all energy used.

Sign lighting for laundries is exceedingly profitable and offers many inducements for consideration, and applies not only to the laundry plant itself, but also to the many agencies which every plant has in the town in which it operates. The following data are presented with the view of assisting the central station in securing that class of business which will be mutually profitable to both the central station and the laundry.

### Steam vs. Electricity.

In determining the relative merits and economies of various systems of drive for laundries where heat as well as mechanical power is required for the complete cycle of operations, it is often argued that the additional coal for sustaining sufficient boiler pressure to operate the engine is negligible when compared with the fuel needed solely to obtain steam for washers, dry rooms, mangles, starch cookers, etc., therefore the engine is considered to perform functions of a cheap and effective "reducing valve" between boiler and heating systems, practically generating at no cost the mechanical power required.

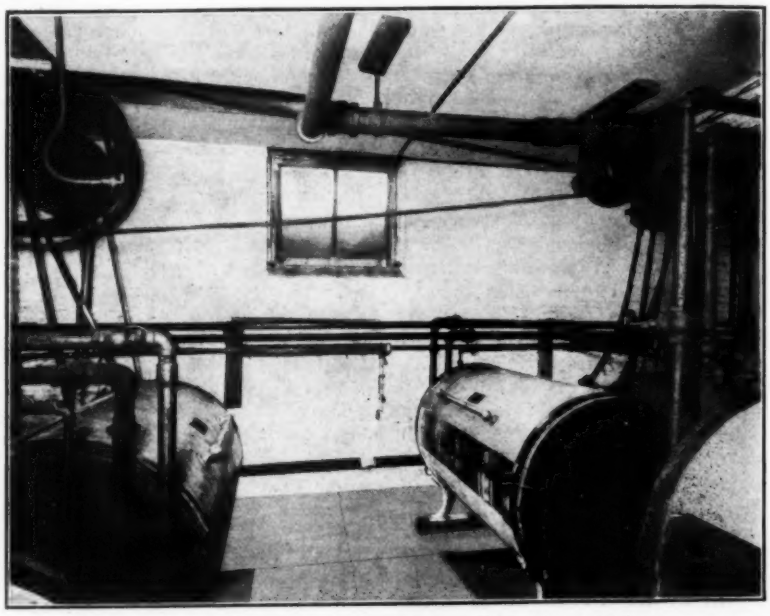
This contention may have value in those rather rare instances of a model steam laundry where the mechanical drive has been installed to show maximum efficiency, live-steam piping is tight and well lagged, the exhaust carried with a minimum of back pressure to proper heaters for feed and washing water as well as providing steam for those machines which permit a sat-

isfactory operation at very low pressure. In short, in installations where all the engineering niceties and refinements have been carefully introduced, it might be doubtful if the change over to electric power, with steam for heating alone, could be made to show an appreciable saving, judged exclusively from the standpoint of the coal pile.

However, after considering that the average small laundry labors against serious wastes in boiler and engine room (incident to careless firing, leaky pipes and valves, wear and tear, and decrease in production due to slippage of belt, and attendant danger from same to women operators; friction losses and bearing trouble accompanying long lines of shafting; annoyance and damage to the clothes, through dripping oil; dependence for continuous operation on one prime mover, and the greater time required for repairs should this single source of power fail; the difficulty in installing the various machines so that the work may be best moved from one to another with minimum handling, etc.), it is to be questioned whether the coal-pile argument may not be justly relegated to a position of minor importance.

Laundry dry rooms, mangles, etc., require live steam, hence a large portion of the total steam generated must be delivered at boiler pressure. In determining the thermal value of the exhaust from a low-pressure engine, due consideration must be given to such variables, as initial gauge pressure and point of engine cut-off, also taking into consideration radiation losses and leaks in main piping, engine cylinder, etc. While under the best conditions it may be possible to realize at boiler pressure, ninety per cent of the heat units contained in the steam at boiler pressure, approximately one-quarter of this amount must be used for heating boiler-feed water, and after deducting for inefficient pipe and cylinder lagging, badly packed glands, leaky valves and joints, and the loss chargeable to engine repair and depreciation, as well as the additional expenditure for oil, waste, packing, etc., it is evident that the value of the thermal units remaining for useful work may be considerably reduced. Also, when steam is used for supplying both power and heat, well sustained and constant gauge pressure is indispensable, if the gauge and the various driven machines are to be kept at normal speed and maximum rate of production.

The economy of electric drive is particularly marked in those cases where the proportion of actual to connected load or total output is small. In a steam-driven plant, the general arrangement and the number of prime movers used, the distance between same and the various driven machines; the length as well as the alinement and proportion of shafting and belting; adjustment of bearing, character of the work done, etc., all affect the ratio between the average amount of energy used and the total output of driving power. It is well known that the transmission losses are seldom less than 40 per cent, the average varying from 30 to 65 per cent, and, in certain cases, being as high as 75 per cent.

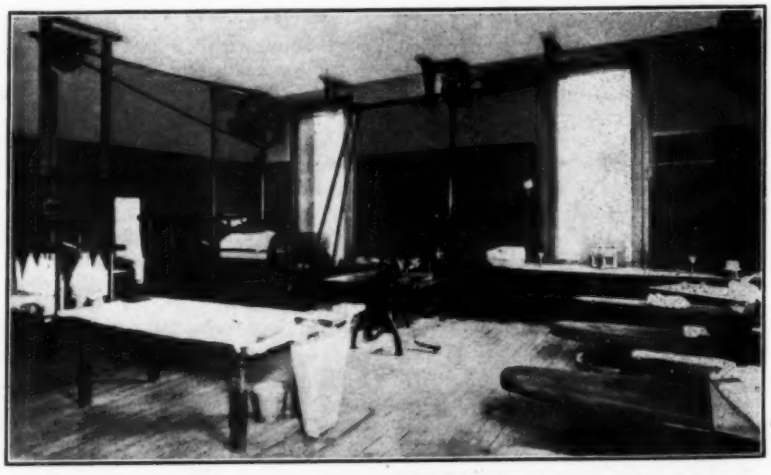


**Motor-Driven Washing Machine, Schrupp Laundry, Chicago.**

The lighter the machinery to be driven, or in other words, the smaller the ratio of power required to drive a machine running idle and when doing actual work, the greater the loss in power used productively. This characteristic is particularly marked in mechanically driven laundries; in fact it has been found by test that the friction loss in such plants with all the machinery in operation is 50 per cent of the total engine power. As the amount of work on hand may decrease, or the necessities of the different departments vary, it will readily be seen that a point may be reached where this figure will be doubled.

**Group and Individual Drive.**

Electricity in the laundry, as considered from the mechanical-power standpoint, resolves itself into group and individual drive. Group drive is subject to several modifications; that is, one large motor running the entire plant, or several small motors running groups of a few laundry machines. Group



**Motor-Driven Flat-Ironing Department, Schrupp Laundry, Chicago.**

drive with one large motor is only of service in plants where it is difficult to get direct belting without the use of quarter turns or beveled gearing from the motor pulley wheel. Group drive of a few smaller machines offers advantages in plants where the layout of the building does not permit of an extensive line of shafting. It is therefore often very convenient, as groups driven by single motors can be located at any angle or at any position, to use motors for this purpose.

Group drive, however, excepting when a few local conditions have to be met, offers no advantage over line-shaft drive direct from the engine, as, while it frequently results in the elimination of a certain percentage of belting, shafting and hangers, yet it does not reduce the quantity appreciably. There are, however, certain conditions which might dictate part group and part individual drive. For instance, if the character of the load will permit of the motor running at or near its normal rated output, it may prove economical to drive the entire battery of both washing machines and extractors from shafting operated by a single motor. However, if some of the machines are in use only a portion of the day it may be preferable to divide the total connected load into two or more groups, so that each group composed partly of washing machines and partly of extractors may operate at as nearly full load as practicable.

Considered from the standpoint of cost, group drive is seemingly more economical in first cost than individual drive. This condition only applies to plants where the line shafts and hangers are already erected, because group drive to attain even approximately its maximum efficiency must be confined to driving a few small machines.

Individual drive is unquestionably accepted as a logical method of operating laundry machines. The difficulties of attaching motors to laundry machines have all been overcome, and suitable brackets and attachments can now be obtained for any make of machine on the market, together with motors of the right speeds, windings and design. Group drive was exceedingly valuable in the earlier days, pending the developments which have subsequently been made, but group drive today is in no way considered by the engineer in charge of a new laundry equipment.

Inspection of a modern up-to-date laundry equipment shows individual motors on every laundry machine. In the majority of cases the motors are directly geared to the machine they drive. In occasional cases power is transmitted by short broad belts. In other cases the motor is directly connected to the laundry machine shaft, but gearing is, on the average, the accepted method of driving machinery. While there is no question as to the feasibility and advantages of driving all laundry machines by individual motors, it should be borne in mind that, while, with few exceptions, most makes of motors on the market could be adapted or redesigned to drive any make, type or size laundry machine, no standard commercial motor available is suited to drive all, there being many special features which have to be incorporated. The more important of these features are: large speed range by field control only; instantaneous reversing as frequently as 40 or 50 times a minute on motors of one horsepower and smaller; reversal on motors up to five horsepower of 4 to 5 times a minute; motors starting with 300 per cent overload, not with a view of using a smaller motor and so effecting an economy, but with a view of meeting the characteristics of the machine driven, which, in this case, calls for slow and gradual acceleration; motors whose ar-

**Schrupp Laundry, Chicago.—Fine-Goods Ironing Department.**

mature windings permit of the same being placed across the line; motors that have to provide for their field circuits being opened under weak field conditions without dangerous flashover.

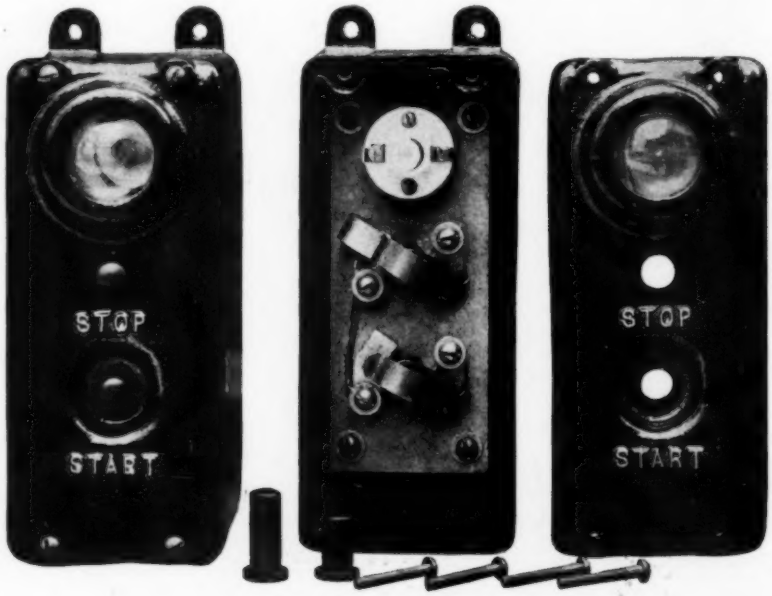
Laundry machines cannot be considered as a whole in relation to motor drive. The individual characteristics of a large number of the machines have to be considered or satisfactory operation will not be obtained, satisfactory operation in this instance not being confined to satisfactory running, but also including the satisfactory production of the work from the laundry machine.

**Laundry Machinery and Motor Characteristics.**

The wash room of a laundry includes washing machines and extractors. For the washer the best results are obtained by directly, where motors having the proper characteristics are available, gearing the motor, which should be operated by remote control. For this application, in addition to the motor there should be located on the washer a push-button box having a "start" and a "stop" button. The motors on the washers are started, accelerated, stopped, reversed and the operation repeated indefinitely by means of magnetic switches in connection with the push buttons on the washers and a pilot-driven drum controller. A view of one of these control boards is shown herewith. All washers or any washer can be operated together and independently of all others. Each washer is therefore a unit in itself. Where standard motors are to be used the best practice is to belt the motors to the machines. The reverse is obtained by a set of two pulleys with an intermediate pulley wheel, the latter causing the machine to reverse after a certain number of revolutions have been made.

Extractors are best driven by vertical motors attached to a bracket on the extractor. The motors drive by means of short broad belts and should be in conjunction with push-button boxes similar to those for the washers, excepting that this push-button box has in addition to the "start" and "stop" button, a pilot light. A view of this device is shown in one of the illustrations. The operation of the extractor is somewhat interesting. An extractor is a centrifugal machine, which throws out the water from the goods as taken from the washers. The extractor revolves at a considerably high speed, and it is exceedingly advisable that the clothes be evenly packed in the basket to prevent excessive wear on the machine or dangerous accidents. The push-button remote-control equipment, therefore, includes an additional feature, which consists of a relay mounted together with the remote-control magnetic switches, resistances and so on. When the operator pushes his start-button, he closes his magnetic switch and lifts his relay. At the same time the pilot light in the push-button box lights. The operator has to retain his finger until the extractor has attained running speed. When the extractor has attained running speed, the relay drops, thus short-circuiting the pilot light and the start-button, and allowing the operator to remove his finger. Removal of finger previous to the extractor attaining running speed opens the magnetic switch and consequently cuts off the current.

The ironing department of a laundry includes a few or many various ironing machines, ranging in sizes from the large flat-work ironer, which handles sheets, table-cloths and bed-quilts, down to ironing machines for the bodies of shirts, under-clothing, wrist bands and bosoms of shirts, etc., and also includes collar and cuff ironers. All these machines are best driven by individual motors, and direct gearing. On the large flat-work ironers, for handling sheets and table-cloths, the motors should be of very special construction and design, allowing for a large positive speed variation. This speed variation is to be obtained irrespective of the pressure applied on the machine or the class of goods being ironed, or in other words, must be independent of the load. The necessity for a large speed variation is that the classes of goods ironed vary very considerably and, inasmuch as the temperature of the chests of the ironing machines are fixed by the steam pressure, the only way of absorbing moisture from the heavy goods as compared with the lighter is by reducing the speed of travel. While a large machine ironing sheets should operate at a speed of some sixty-six feet a minute, yet the same machine ironing bed-quilts could not operate beyond twenty feet a minute. There is also available for use on the flat-work ironers an ingenious safety device consisting of a trip bar on the feed side of the machine. If the operator's hand should happen to get caught in the goods she is feeding in the ironer, she will strike against this safety bar. This safety bar mechanically relieves the clutch and also, by means of some special contacts, shuts down the motor. Further than this, this safety bar must be in place before the motor can be started, and electrically it is possible to throw the clutch in only at the slow speed.

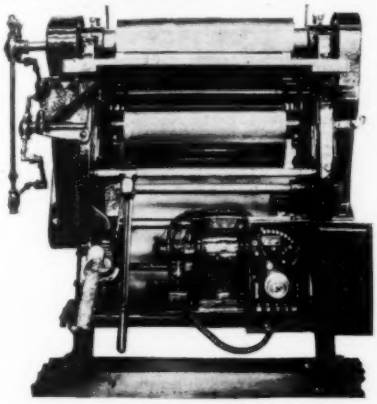



**Push-Button Control for Extractor.**

The same remark applies in a lesser degree to the collar and cuff ironers. The other machines in the ironing room all call for no speed variation, but call for motors in some cases of peculiar characteristics. For instance, the ironers used for shirt bodies, barbers' coats, etc., reverse 30 to 40 times a minute. A very special motor therefore has to be employed to stand this reversing strain, without causing heating, sparking or injury. Other machines that are suitable for individual motor drive are dry rooms, marking machines, dampener presses, starching machines, etc.

All modern laundries also have in addition a power-driven gas machine for making gas for heating some of their ironing machines. They also have mo-

tor-driven self-controlling pumps, and in many cases are now installing vacuum cleaners for cleaning their buildings, for cleaning rugs and for keeping their machines and electric equipments free from lint and dirt. These all offer

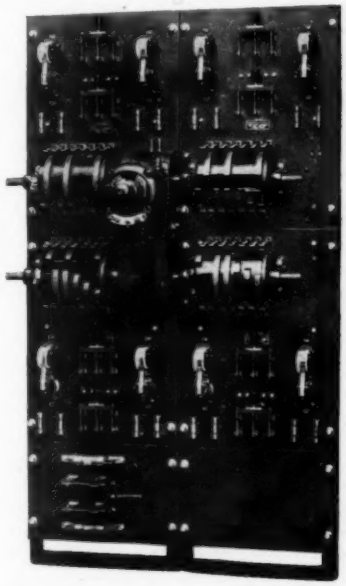


**Ironing Machine with Motor and Starting Box Equipped with Snap Switch.**

opportunities for the application of electric motors.

**Miscellaneous Current-Consuming Devices.**

Electric bleaches or chlorinators are attaining well deserved recognition and are to be seen in an increasing num-

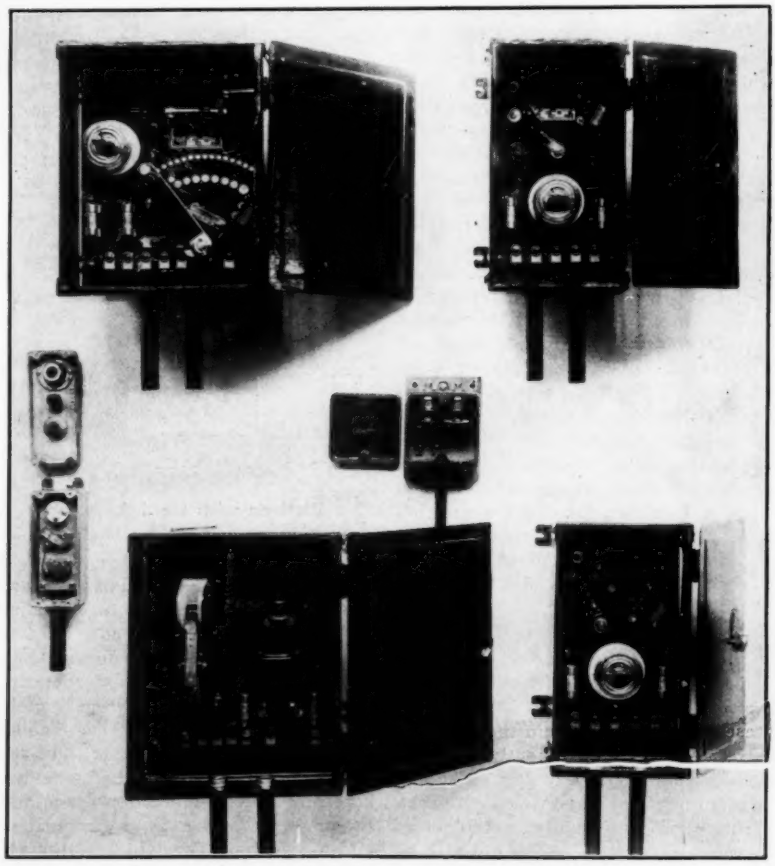


**Controller Board for Motor-Driven Washing Machine.**

ber in different plants located all over the country. This machine manufactures electrolytic bleach from a salt solution and calls for a current consumption of approximately three horsepower.

Electric heating for body ironers, sleeve ironers, presses, and flatirons is also attaining recognition, and the former difficulties of obtaining heat units which would stand the extreme and continuous service are fast being overcome. Electric heating devices are applicable to a large number of laundries that are not at present using the same, but are by no means applicable to all laundries, as their use depends entirely on the current cost.

The use of electric flatirons is fast increasing, as manufacturers of this apparatus are apparently turning out irons which will stand the service. A recent device which has appealed to the laundry industry is an ironing equipment consisting of a pilot light which shows when the iron is in use, an arm



**Special Starting Boxes for Electric Laundry Service.**

for taking up the tension on the cord, and an iron stand which automatically cuts the current off from the iron when the same is placed on the stand. The stand is heated to an adjustable degree when the iron is placed thereon, control being effected by a hand switch. This stand materially reduces the danger of burnout and over-heating, and yet at the same time keeps the iron at a usable temperature with minimum current consumption.

**Power Requirements.**

The laundry-machinery business, while of comparatively recent origin has yet been one of extraordinarily rapid growth. The developments of machines for different services has been large and varied. There are consequently a very large number of different kinds and types of machines in use, or which are now on the market. This condition makes it exceedingly difficult to give any definite information as to the power required to drive, and as to the characteristics to be met for different machines, as no general lists can be given, and as a large number of details would have to be covered. Also each individual case offers problems that must be considered by the engineer. A few general figures are given below, but the editors will be glad to answer any questions relative to power requirements of any individual machine or machines.

Washing machines require from 1 to 5 horsepower; extractors, starting load from 2 to 20 horsepower, running load from 0.5 to 5 horsepower; flat-work ironers 0.25 to 4 horsepower; ironing machines from 0.25 to one horsepower; press machines from 0.25 to one horsepower; dry rooms from 0.5 to 3 horsepower; dampening machines from 0.25 to 0.5 horsepower; starching machines from 0.16 to 0.5 horsepower; marking machines, one-eighth horsepower; dry-

ing tumblers from 2 to 4 horsepower; electric heating machines, single rolls, 5,000 watts; body ironers, 4,000 watts; sleeve ironers, 2,000 watts; band ironers, 1,000 watts; sad irons 500 watts; sewing machines from one-eighth to one-quarter horsepower.

One problem which has to be answered by the laundry considering electric drive is as to the type and voltage of current to be installed. The general practice which has been advocated, and which seemingly is a wise one where the plant is to generate current, is that the laundryman should install his apparatus to correspond to the current and voltage of the section of the city in which his plant is located.

Alternating-current equipments can now be obtained for laundry machines which operate in every way as satisfactorily as direct current. This called for considerable development work along lines of special alternating-current motors, but it is possible to obtain today squirrel-cage motors for any laundry machine on the market which will operate as satisfactorily as their direct-current predecessors, this remark applying to reversing machines and to variable-speed machines. Alternating-current motors have the additional advantage of no commutators or troublesome windings, the cost of maintenance is therefore appreciably small and is confined to keeping the bearings in good condition. Equipments corresponding in every way to the above can even be furnished for single-phase current, the adaptation, if used, consisting of installing the standard polyphase equipments and converting to single-phase current.

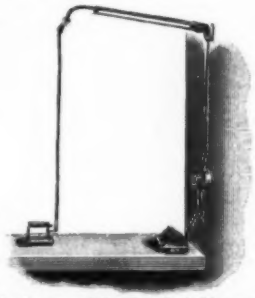
### Wiring.

The wiring of laundries sometimes involves features not encountered in the usual run of electrical construction, these arising mainly from the fact that extreme dampness frequently exists in certain rooms. In very damp places it is often preferable to employ open wiring or else to install the conductors in wooden troughs. For open work rubber-covered wire should be used, and the circuits supported on non-absorptive cleats or knobs. Except where there is excessive moisture, however, rigid conduit construction is desirable.

In the location of switches the same rules should generally govern as apply in other classes of interior wiring and distribution. The service switch should open both sides of the circuit, of course, as the Underwriters' rules require, and it may be added that the meter should not be installed in a place subjected to extremes of temperature. The proper location of the meter will often necessitate a run of conduit between the service and the meter. The switches should generally be grouped, but convenience should not be sacrificed to any desire to reduce the number of groups. In rooms where there is considerable dampness all switches should be installed either in moisture-proof boxes or on porcelain knobs.

### Installations.

An excellent example of what central-station service can do for the small laundry is shown in the following data relative to power costs at the Model Laundry, Red Wing, Minn. The plant, previous to May, 1910, used a Taylor & Chandler steam engine rated at twenty horsepower, and a thirty-horsepower boiler operating at a pressure of 50 to 70 pounds. Soft coal, costing $4.50 per ton, was used for fuel. The plant operates twenty-six days per month. The cost of steam power per month on a twelve-months' basis was as follows: Coal, 21.5 tons, $96.75; engineer, $65; water $7.70; oil and waste, $8.20, making a total cost per month of $177.65.



**Flatiron with Cord Adjuster.**

In May, 1910, the Menominee & Marinette Light & Traction Company installed three electric motors totaling eighteen horsepower and connected as follows: one three-horsepower 1,800-revolution-per-minute motor operating a collar machine, body ironer, neck-band ironer, shirt polisher, collar shaper, shirt-bosom starcher, cuff and shirt starcher, collar starcher; one five-horsepower 1,800-revolution-per-minute motor operating a five-roller mangle and a 2,000-pound freight elevator and one ten-horsepower 1,800-revolution-per-minute motor operating four 700-shirt washers, two twenty-eight-inch basket extractors and one carpet wheel.

The cost of electric power per month on a ten-months basis is figured as follows, including live steam for drying and steam. Coal, fourteen and one-third tons, $64.50; extra labor, $5.50; water, $305; oil and waste, $2.10; electric current, $50.28. The rate for energy is $1.00 per connected horsepower per month and three cents per kilowatt-hour net. The total cost therefore, using electric power, is $125.43, which is a saving of $52.22 per month or $626.64 per annum over the cost of steam power, which as previously pointed out amounted to $177.65 per month.

Another installation of central-station service in a laundry that is deserving of especial attention is that in the Oklahoma Laundry at Enid, Okla. Here the Garfield County Gas & Electric Company had to contend with cheap fuel in the shape of oil. The installation comprises eight motors, aggregating twenty-three horsepower connected as follows: One ten-horsepower, 1,200-revolution-per-minute motor belted to a line shaft driving two 150-shirt washers, two 100-shirt washers, one 75-shirt washer and two 26-inch extrators; one five-horsepower 1,800-revolution-per-miute motor belted to countershaft driving a 200-shirt washer, a 50-shirt washer, a 20-inch extractor and a tumbler; a three-horsepower 1,800-revolution-per-minute motor belted to a countershaft driving one four-roll mangle; a one-half-horsepower 600-revolution-per-minute motor direct connected to a thirty-six-inch Davidson exhaust fan; a one-half-horsepower, 1,800-revolution-per-minute motor belted direct to a dry-room fan; a one-horsepower, 1,800-revolution-per-minute motor belted direct to countershaft driving collar and cuff ironer; a three-horsepower 1,800-revolution-per-minute motor belted to a line shaft driving two bosom presses, two neck-band ironers, two sleeve ironers, two body ironers; a one-thirtieth-horsepower, 1,800-revolution-per-minute sewing machine motor belted direct to a collar dampener. There are also six electric flatirons used in the hand-ironing department.

The plant operates sixty hours per week and the average monthly kilowatt-hours' consumption is 2,331. The load-factor of the plant is twenty-three per cent. All motors are three-phase, sixty-cycle, 220-volt.

This motor installation replaced a steam-engine drive and was secured by a trial installation. The boiler plant consists of one 100-horsepower fire-tube boiler for supplying steam, using crude oil for fuel. Before installing motors, an average of 2,069 gallons of oil was used per week at two and three-quarter cents per gallon. Since installing motors the oil consumption for fuel has been reduced sixty per cent.

This laundry also had installed before putting in motors, one ten-kilowatt 110-volt direct-current, direct-connected generator, for furnishing current for flatirons and lighting, which has been closed down, and now all current is bought from the electric company. It has been the means of securing a contract from another laundry in town. This is a striking example of what can be accomplished with electric drive, in competition with cheap fuel.

**Laundry Power Data—Sheet No. 1.**

The Imperial Sanitary Laundry, Mobile, Ala., does a general laundry business. Individual drive. Running hours per week, 56.

Total connected horsepower, 20; total number of motors installed, 15; average kilowatt-hours per month, 1,960; load-factor, 21 per cent.

Kilowatt-hours consumption for 12 months: 1910: January, 430; February, 1,600; March, 1,410; April, 1,600; May, 1,900; June, 2,540; July, 2,650; August, 2,560; September, 2,390; October, 1,670; November, 2,460; December, 2,310.

MOTOR INSTALLATION.

The following includes the list of motors installed with their respective drives. All motors use direct current operating at 220 volts:

| No. | Horse-power | Speed R. P. M. | Application |
|---|---|---|---|
| 2 | 2 | 1,200 | Vertical motors, each belted to a 26-inch extractor. |
| 1 | 7.5 | 1,200 | Belted to line shaft driving five 100-shirt washers. |
| 1 | 1.5 | 830 | Geared to one 4-roll mangle. |
| 1 | .5 | 830 | Geared to one collar table. |
| 1 | 1 | 830 | Geared to one collar mangle. |
| 1 | 1 | 830 | Geared to one shirt-bosom press. |
| 1 | .5 | 830 | Geared to one shirt-body ironer. |
| 1 | .33 | 830 | Geared to one shirt-body ironer. |
| 1 | .33 | 830 | Geared to one collar dampener. |
| 1 | 1 | 830 | Geared to one fan in dry room. |
| 1 | .25 | 830 | Belted to one collar starcher. |
| 1 | .25 | | Geared to one blower for gas irons. |
| 1 | .20 | 830 | Belted to one cuff starcher. |
| 1 | 1 | 1,265 | Belted to one gas-making machine. |

Palmer House Laundry, Chicago, Ill. Does a general hotel laundry business. Group and individual drive. Running hours per week, 60.

Total connected horsepower, 63. Total number of motors installed, 8. Average kilowatt-hours per month, 5,650. Load-factor, 34 per cent.

Kilowatt-hours consumption for 9 months: 1911: January, 5,564; February, 5,881; March, 5,764; April, 5,763; May, 5,981; June, 5,951; July, 5,428; August, 5,651.

MOTOR INSTALLATION.

This installation consists of the following, all motors being 220-volt direct-current machines:

| No. | Horsepower | Application |
|---|---|---|
| 1 | 15 | Belted to a shaft driving a 40 by 63-in. washer; one 30 by 45-in. washer, one 32 by 44-in. washer. |
| 1 | 15 | Driving a 34 by 48-in. washer, a 23 by 44-in. washer, and a 24-in. extractor. |
| 1 | 7.5 | Belted direct to a 40-inch extractor. |
| 1 | 7.5 | Belted direct to a 36-inch extractor. |
| 1 | 5 | Belted direct to a 26-inch extractor. |
| 1 | 5 | Belted direct to a 48-inch exhaust fan. |
| 1 | 5 | Belted to a 6-roll mangle. |
| 1 | 3 | Belted direct to a 4-roll mangle. |

The manager of this laundry is exceptionally enthusiastic over the improved results obtained since the installation of central-station service. This laundry is conducted in connection with the hotel business of the Palmer House Company and previously was driven from a line shaft driven from the steam engine in the hotel's engine room. Writing of central-station service, the manager states: "I don't think any form of power can compare with central-station service. I have been in the business 20 years, but it is only since the adoption of Edison service in this plant that I have ever really enjoyed my work. I cannot recommend it too strongly."

The Model Laundry, Scottdale, Pa. Does a general laundry business. Group and individual drive. Running hours per week, 57.

This plant is equipped with modern machinery made by the American Laundry Machinery Company and does work having an average value of $100 per day. Four men and eight girls are employed.

The total capacity of twelve horsepower in squirrel-cage induction motors is installed, having a maximum demand of six horsepower and a load-factor of 25 per cent. Energy supplied is 2-phase, 60-cycle, 220-volt.

Kilowatt-hours consumption for 8 months: 1911: January, 276; February, 743; March, 726; April, 706; May, 744; June, 673; July, 709; August, 768.

MOTOR INSTALLATION.

| No. | Horse-power | Speed R. P. M. | Application |
|---|---|---|---|
| 1 | 1 | 1,700 | Back-geared and belted to 4-loop Hagen dry room. |
| 1 | 2 | 1,700 | Belted to 120-inch Hagen flat-work roll. |
| 1 | 2 | 1,700 | Belted to a 20-foot, 4-hanger line shaft driving one bosom press, one sleeve roll, one body roll, one Simplex No. 2 air compressor for operating one cuff press, one yoke press and 2 collar presses. |
| 1 | 1 | 1,700 | Belted to a 12-foot, 2-hanger line shaft driving one 2-loop Hagen dry room, one 14-inch Bishop starcher and one Harriman collar dampener. |
| 1 | 1 | 1,700 | Belted to a 12-foot, 3-hanger line shaft driving one collar shaper, one collar folder and one 24-inch collar and cuff ironer. |
| 1 | 5 | 1,700 | Belted to a 20-foot, 5-hanger line shaft driving one 36 by 48-inch washer; two 33 by 48-inch washers and one 26-inch extractor. |

**Laundry Power Data—Sheet No. 2.**

The Schrupp Laundry, Chicago, Ill. Does a general laundry and cleaning business. Group drive. Running hours per week, 59.

Total connected horsepower, 23; total number of motors installed, 6; average kilowatt-hours per month, 2,600

Kilowatt-hours consumption for twelve months: 1910: March, 2,436; April, 2,601; May, 2,460; June, 2,605; July, 2,689; August, 2,411; September, 3,011; October, 2,964; November, 2,880; December, 2,937. 1911: January, 2,992; February, 3,062.

MOTOR INSTALLATION.

All motors are 220-volt induction motors operating at 1,800 revolutions per minute. The installation consists of the following:

| No. | Horsepower | Application |
|---|---|---|
| 1 | 5 | Belted to line shaft to which is connected a Nelson-Kruder No. 9 washing machine, Nelson-Kruder No. 3 washing machine, and American 26-in. extractor, a Nelson-Kruder bosom ironer and sleeve ironer. The two latter machines are belted to this shaft through the floor, being located above the washing department. |
| 1 | 5 | Belted to a counter shaft driving a Nelson-Kruder body ironer, a neck-band ironer, 2 Nelson-Kruder No. 3 washers and a 24-inch ventilating fan. |
| 1 | 5 | Belted to a shaft driving 2 Nelson-Kruder No. 3 washers, 2 American No. 2 washers, one bosom ironer and one 24-inch American extractor. |
| 1 | 2 | Belted to a Barnes & Erb collar ironer and a Nelson-Kruder body |
| 1 | 3 | ironer. |
| | | Driving a Barnes & Erb No. 16 bosom starcher, a Bishop cuff starcher, |
| 1 | 3 | a Bishop collar starcher and 2 Barnes & Erb dry rooms. |
| | | Belted direct to a counter shaft driving a Hagen 4-roll mangle and W. W. W. shaker. |

This plant also employs nine 250-watt electric flat ironers equipped with automatic cord regulators and pilot lamps. Views of the Schrupp Laundry are shown in the illustrations accompanying this article.

Palace Laundry, Oklahoma City, Okla. Does a general laundry business. Combination drive. Running hours, per week, 60.

Total connected horsepower, 42; total number of motors installed, 24; average kilowatt-hours per month, 3,144; load-factor, 16 per cent.

Kilowatt-hours consumption for 10 months: January, 2,218; February, 3,193; March, 3,628; April, 3,389; May, 3,524; June, 4,163; July, 4,096; August, 3,953; September, 3,630; October, 1,867.

MOTOR INSTALLATION.

This installation consists of 220-volt motors as follows:

| No. | Horse-power | Speed R. P. M. | Application |
|---|---|---|---|
| 2 | 2 | 1,100 | Direct-connected to two 26-inch extractors. |
| 1 | 10 | 650 | Belted to a line shaft driving four 100-shirt washers, two 150-shirt washers, one 50-shirt washer and one 36-inch exhaust fan. |
| 1 | 10 | 650 | Belted to a line shaft driving four 150-shirt washers, three 26-inch exhaust fans and a tumbler. |
| 2 | 1 | 450 | Each direct-connected to a 36-inch exhaust fan. |
| 1 | 3 | 850 | Geared to 4-roll mangle. |
| 1 | 3 | 1,050 | Geared to 4-roll mangle. |
| 2 | 1 | 900 | Belted to 2 dry rooms. |
| 1 | 1/8 | 1,000 | Geared to collar dampener. |
| 1 | 1/8 | 1,500 | Geared to collar starcher. |
| 1 | 1/2 | 450 | Belted to 24-inch extractor. Vertical motor. |
| 1 | 1/6 | 1,200 | Geared to band starcher. |
| 1 | 1/8 | 1,000 | Geared to neck-band ironer. |
| 3 | 1/4 | 800 | Each geared to a sleeve ironer. |
| 1 | 1/3 | 1,000 | Geared to body ironer. |
| 1 | 1/3 | 620 | Geared to body ironer. |
| 1 | 2 | 1,000 | Geared to rotary blower. |
| 1 | 1/2 | 1,025 | Geared to bosom press. |
| 1 | 3/4 | 900 | Geared to collar mangle. |
| 1 | 1/2 | 600 | Geared to collar table. |

This laundry has individual drive throughout with exception of washing machines. There is also installed one 100-horsepower boiler for heating and washing purposes, burning natural gas; average consumption of gas per month is 1,200,000 cubic feet; employ one fireman at $60 per month.

The following is a brief summary of data of a few plants using central-station service:

| Plant No. | No. of Motors | Total Horsepower. | Average Kilowatt-hours per Month. | No. of Hours per Week in Operation. |
|---|---|---|---|---|
| I | 8 | 23 | 2,551 | 60 |
| II | 3 | 18 | 1,000 | 57 |
| III | 6 | 12 | 690 | 57 |
| IV | 15 | 20 | 1,960 | 56 |
| V | 8 | 63 | 5,650 | 60 |
| VI | 6 | 23 | 2,600 | 60 |
| VII | 24 | 42 | 3,144 | 60 |
| VIII | 6 | 18 | 2,005 | 60 |
| IX | 8 | 28 | 2,414 | 60 |
| X | 6 | 25 | 2,587 | 60 |

The average load-factor of laundries is 20 per cent.

# Commercial Practice
# Management, Rates, New Business

## DETAILS OF A HOUSE-WIRING CAMPAIGN.

### Newspaper Advertising Solely Relied Upon.

It is generally conceded that newspaper advertising is essential to every central station but just to what extent this form of advertising could be relied upon to produce new business without other assistance has been problematical.

To gain, if possible, accurate data on this subject, H. M. Byllesby & Company conducted a test campaign in several of the towns served by Byllesby properties the results of which are interestingly shown in the accompanying table. While the figures presented in this table show that, save for a few cases, the campaign was profitable, there is very little relation between the figures of different towns and no general conclusions can be drawn except that newspaper advertising will produce widely different results in different localities.

In considering the figures there are several features that should be given due attention. To begin with, the campaign dealt with house-wiring. As all solicitors know, it is usually very difficult to secure house-wiring contracts without extending every effort and using every tool at the disposal of the solicitor. To rely, therefore, entirely upon newspaper copy without personal calls or even follow up letters was indeed giving advertising a severe test.

Another point to be considered is that in several of the localities house-wiring campaigns have recently been carried on and in all of the towns included in the list more or less strenuous action is constantly being carried on to increase the number of customers. In no town was this the first campaign to secure unwired houses.

The campaign was carried on for one month (October), four advertisements being published. A Saturday evening or Sunday morning paper was used in each town and exactly the same copy and same size advertisement used. The four accompanying illustrations show the four insertions. As will be noted a coupon proposition was employed. The prospect was requested to cut out the coupon and bring it into the company's office. Arrangements were then to be made with any contractor and by presenting the contractor's receipted bill to the company, the customer would obtain a cash rebate of twenty per cent of the amount. No coupons were honored unless deposited with the company during the month of October.

The first advertisement was prepared to appeal directly to the house owner, pointing out the advantages and economy of electricity. Advertisement No. 2 directed tenants of houses to send the advertisement to their landlord, with this commentary, "most landlords will wire the houses they rent if the people really want electric light. Wired houses secure good tenants easily."

The entire campaign was planned and carried out under the personal direction of W. H. Hodge, manager of the publicity department, with headquarters at Chicago.

**Send This Proposition to Your Landlord and Ask Him to Wire Your House for Electric Light**

THE ELECTRIC LIGHT COMPANY will make him a present of 20% of the cost of the job if he will bring or send the attached coupon to our office.

Most landlords will wire the houses they rent if the people really want electric light. Wired houses secure good tenants easily.

Clip out this entire advertisement to-day and mail it your landlord with your name on the margin.

This will be an easy way of convincing him that henceforth you will insist upon living in a house equipped for modern lighting.

Good household lighting can be afforded by every family of moderate means. We have the figures to prove it.

The average bill for residence lighting with electricity in this city is $1.82 per month.

For an average price of $1.82 per month is sold absolutely the best, the cleanest, the most convenient and safest lighting in the world.

Our proposition simply means giving the house owner the usual cost of obtaining the business—the time and expense of expert salesmen.

All the house owner has to do is to come or send to our office, instead of letting us send a man to him.

First present the attached coupon at our office—then go to any electrical contractor and make arrangements direct.

Later, when the job is completed, upon presentation of the contractor's receipted bill, we pay the coupon holder 20 per cent. of the amount in cash.

October is a dull month for electrical contractors. They are willing to make prices lower than ordinary.

This plan enables us to use our salesmen on other lines of work. We are willing to pay for this privilege and let the money go into the pockets of the house owners.

**House-Wiring Coupon**

Not good unless Presented in October and Redeemed Before January 1, 1912.

This Coupon presented at our office will be exchanged for a receipt entitling the holder to a Cash discount of 20 per cent. on house wiring jobs.

Houses must be adjacent to our lines, and completed and occupied. No discount in excess of $10 per house will be allowed.

**Mobile Electric Company**

THEO. K. JACKSON, Gen'l Manager

11 NORTH ROYAL STREET

Bell 3185 : TELEPHONES : Home 22

Second Advertisement of Mobile Electric Company.

**October 31st Absolutely Ends Our 20 Per Cent Saving House wiring Plan.**

**Only Eight Days Are Left to Send or Bring the Attached Certificate to Our Office and Thereby Save One-Fifth of the Cost of Wiring Your House for Electric Light.**

Electric house wiring is not an expense. It is one of the soundest investments you can make. Any time you sell your property you can get the money back with interest.

Once a house is wired for electric light the job is done for all time. It will outlast the building.

Any dwelling is made more attractive by the installation of electrical equipment.

Good household lighting can be afforded by **every** family of moderate means. We have the figures to **prove** it.

The average bill for lighting with electricity in this city is **$1.55** per month.

For an average price of $1.55 per month is sold absolutely the best, the cleanest, the most convenient and the **safest** lighting in the world.

It would be cheap at twice the price.

Eyesight is precious. Good lighting is real economy.

One week is left to take advantage of this remarkable money-saving offer. Soon the electrical contractors will be busy installing signs, commercial lighting and power apparatus and they cannot afford to take **housewiring jobs at low prices.**

The number who have already accepted the offer is surprising. It is a tribute to the purchasing ability and thrift of our citizens.

Our proposition simply means giving the housowner the usual cost of obtaining the business—the time and expense of expert salesmen.

All the houseowner has to do is to come or send to our office, instead of letting us send a man to him.

First present the attached coupon at our office—then go to **any** electrical contractor and make arrangements direct.

Later—when the job is complete, upon presentation of the contractor's receipted bill we pay the coupon holder **20 per cent of the amount, in cash.**

House Wiring Coupon.

Not good unless presented in October and Redeemed before January 1, 1912.

This coupon presented at our office will be exchanged for a receipt entitling the holder to a cash discount of 20 per cent. on house wiring jobs.

Houses must be adjacent to our lines, and completed and occupied. No discount in excess of $10 per house will be allowed.

**Consumers Power Co.**

Herbert Markle, Mgr.

Telephone 234 So. Main St.

Fourth Advertisement of Consumers' Power Company.

| Property. Population. | Number Coupons Returned. | Percentage of Prospects Replying. | Cost of Advertising. | Average Cost per Return. |
|---|---|---|---|---|
| Mankato, Minn. ..... 11,000 | 57 | 6 | $ 84.00 | $ 1.32 |
| Fort Smith, Ark ..... 24,795 | 47 | 4.7 | 80.00 | 1.70 |
| Albany, Ore. ..... 5,500 | 18 | 5.6 | 35.00 | 1.94 |
| Mobile, Ala. ..... 60,000 | 98 | 16 | 240.00 | 2.45 |
| Ottumwa, Iowa ..... 22,000 | 25 | 2.5 | 70.00 | 2.80 |
| Grand Forks, N. D. ..... 12,478 | 66 | 5.5 | 187.00 | 2.83 |
| Northfield, Minn. ..... 3,264 | 9 | 9 | 40.00 | 4.44 |
| El Reno, Okla. ..... 7,872 | 17 | 11 | 86.00 | 5.05 |
| Cannon Falls, Minn. ..... 1,460 | 6 | 6 | 32.00 | 5.33 |
| Enid, Okla. ..... 13,799 | 15 | 3 | 103.40 | 6.89 |
| Fargo, N. D. ..... 14,331 | 15 | 5 | 124.00 | 8.26 |
| Faribault, Minn. ..... 9,001 | 6 | 6 | 63.00 | 10.30 |
| Muskogee, Okla. ..... 30,000 | 7 | 7 | 90.00 | 12.80 |
| Sandpoint, Idaho ..... 3,500 | 5 | — | 80.00 | 16.00 |

### Commonwealth Edison Pension Plan.

The Commonwealth Edison Company has announced an annuity plan for its employees, taking effect January 1. The plan will give to continuous employees at the end of certain periods of years an annuity based on time of service.

**New Business Activities at Muskogee.**

About two years ago the capacity of the Muskogee Gas & Electric Company's electric station was 800 kilowatts. To-day the capacity is considerably over 4,600. The company now has a total of 3,095 customers, has installed 128 electric signs, has a lighting load of 3,248 kilowatts, a power load of 1504 kilowatts, and a railway load of 193 kilowatts. This development, which is really remarkable for a town of approximately 30,000 inhabitants, is due to the aggressive new-business policy which the company has adopted.

**Welcome Arch.**

Everyone in Muskogee is a booster and alive to all the advantages of electricity for use in town-building, and there are very few residences within reach of the distributing system that are not using electric lights. As far as the down-town district is concerned, it is sufficient to say that Muskogee not only claims, but has, more electric signs per capita population than any city in the United States.

Every progressive merchant in Muskogee boasts of an electric sign. At night the streets are brilliant with the light from thousands of lamps which are installed in signs of every conceivable description. New signs are always being erected, and each citizen takes pride in bringing the visitor to Muskogee down into the town at night to see the illumination. The welcome arch, which was presented to the city by the Muskogee Gas & Electric Company, is particularly conspicuous and is noticed and admired by every visitor to Muskogee. One of the events of more than passing interest during the year was the Muskogee Fair, at which the Muskogee Gas & Electric Company maintained a very attractive exhibit. Two views of this exhibit are shown herewith. A feature that attracted considerable attention was the electric kitchen comprising an electric range and a kitchen cabinet. Electrically cooked food was served together with coffee made in electric percolators. The menu was changed each day during the six days of the show and it was estimated that over 17,000 persons visited the booth. The company reported excellent success with the range, not a single failure marring the exhibit. A device that attracted considerable attention during the show was a phonograph with specially prepared records which called out to the people to see the display, and made mention of practically every electrical device and its uses.

The new-business department of the Muskogee Gas & Electric Company is in charge of Norman B. Hickox, who is, in a large measure, responsible for considerable of the new business taken on. The company is increasing its connected load at the rate of three and one-half per cent per month.

**New York Edison Company Establishes Extensive Courses of Instruction for Its Employees.**

The New York Edison Company has opened a school of instruction in commercial courses for its employees. The school was arranged by the contract and inspection department under Arthur Williams, but it is open to any of the five thousand employees in the company, men and women. The instructor is H. E. Grandstaff, graduate of Denison College and Chicago University, and the secretary is Miss Gertrude Waters, a Syracuse University graduate. Sessions are held on Mondays, Tuesdays, Wednesdays and Fridays from 4 p. m. till 5:30 p. m., entirely without charge and on the company's time. The term will close in June, certificates and diplomas being given to those attaining a grade of eighty per cent. The instruction will be arranged under four general divisions, as follows:

Course 1.—The elements of central-station business getting.

Course 2.—Hygiene, health and elements of psychology.

**Norman B. Hickox.**

Course 3.—Basic principles of salesmanship and their relation to business building.

Course 4.—Scope, policies and organization of the New York Edison Company.

Outside of the regular corps of instructors distinguished lecturers have been engaged for courses 2 and 3, including Winthrop Talbot of Cleveland, Doctor Luther H. Gulick for Course 2. For Course 3 the following will lecture: Walter Dill Scott, professor of psychology, Northwestern University; John D. Kenyon vice-president of the Sheldon School; D. C. Seitz, business manager of the New York *World;* S. Rollin Hall, of the International Correspondence Schools; Harrington Emerson, "efficiency engineer," and Lee Galloway, New York University.

**Electric Kitchen.**

**Exhibit at Muskogee Fair.**

# Electrical Construction

## NOTES ON ELECTRICAL CONSTRUCTION.

By George J. Kichgasser.

**This is the first of a series of articles on electrical construction. The matter will be treated in a thoroughly practical manner, and will cover every phase of construction usually encountered by the electrical contractor or the electrician in an industrial plant. This article deals with a general discussion of circuit characteristics and wiring requirements.**

### Series and Multiple Circuits.

There are two principal types of lighting circuits, namely, multiple circuits and series circuits. The first of these are called constant-voltage circuits, while the other type is usually styled constant-current circuits. Practically all incandescent lamps for inside lighting and also most motors are connected in multiple. Outside lighting systems, however, are generally operated on series circuits. In ordinary multiple interior lighting circuits the lamps or fixtures are tapped from the two opposite wires as indicated in

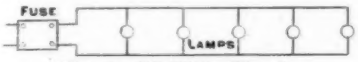



**Fig. 1.—Multiple Circuit.**

Fig. 1. It is clear from the figure that turning one lamp off or on does not affect the current passing to the others. With a series circuit, however, the arrangement of the lamps of which are illustrated in Fig. 2, all the current passes through each lamp. Therefore, if one lamp is disconnected the current passing through the entire loop is cut off. In most of the outdoor series tungsten-lamp systems, however, some special type of socket is used to prevent an interruption of the current. These sockets are so designed that the circuit is re-established automatically in case one or more of the lamps is burned out or broken. It is sometimes desirable to operate a number of these lamps in series on a constant-voltage

**Fig. 2.—Series Circuit.**

circuit; for example, nine 12-volt series tungsten lamps may be connected in series across a line whose voltage is 108; but in such a case the sockets used is of a type which not only closes the circuit automatically when a lamp burns out or is broken, but at the same time also introduces a resistance equal to that of the lamp just removed. But for this automatic introduction of resistance each of the remaining eight lamps in the case mentioned would obviously be left burning at nearly 14 volts instead of 12, with the result that the burning out of the rest of them would soon follow. It should be explained at this point, though, that this use of straight series lamps on constant-voltage lines is not so general as their use on constant-current circuits. In circuits of this latter type the number of amperes flowing through the lamps is prevented from changing by changing the voltage of the line when the number of lamps burning changes. This adjustment is entirely automatic and is obtained by the use of some special type of transformer or regulator located at the power station, or some other point of control.

Where a large series-arc or tungsten system is operated on direct-current service the current in some installations is kept constant and the voltage varied to suit the number of lamps burning by the action of the dynamo itself. If, for instance fifty 60-volt, 9-ampere, direct-current arc lamps are to be operated the dynamo must be able to develop a little more than 3,000 volts (60x50), there being a little loss of pressure or voltage due to the resistance of the conductors. If at some time only forty of these lamps happen to be burning, the dynamo is called upon to generate only a little over 2,400 volts.

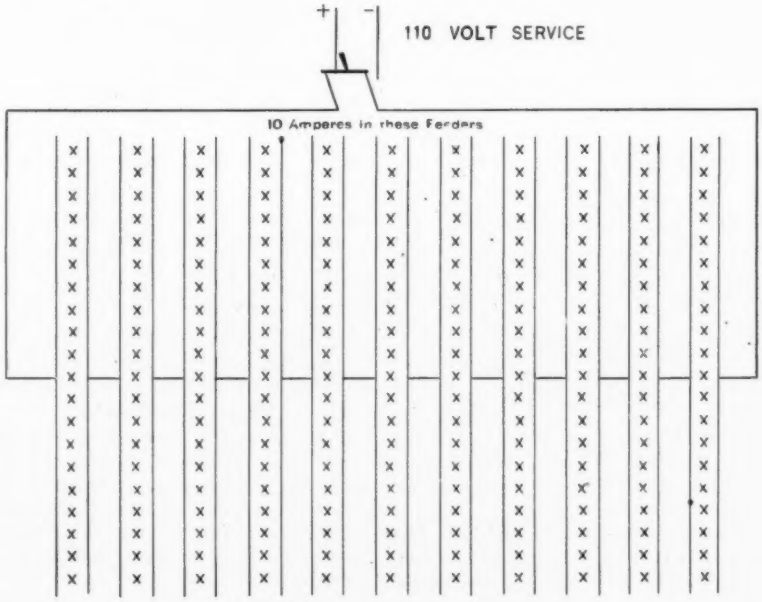



**Fig. 3.—Multiple-Series Circuits.**

Another interesting application of the series circuit is found frequently in installations for decorative lighting. Decorative series-lighting systems for Christmas trees and the like are approved for temporary use, where the voltage of the system does not exceed 150 and where the wattage (total watts) of lamps dependent upon one cut-out (fuse) does not exceed 1,320.

In a multiple circuit the voltage is

the same (or practically so) at each outlet but the current flowing depends upon the number of lamps, motors or other devices in operation. If the lamps were of different sizes they would take different quantities of electricity; an electric radiator requires more amperes than an electric toaster, etc. In a series circuit, on the other hand, different devices of various current-carrying capacities could not be connected in circuit in this way. The current taken by the largest, say nine amperes, would flow through the others in series and burn them out.

Sign lighting on direct-current systems is sometimes accomplished by means of multiple-series circuits as indicated in Fig. 3. Low-voltage lamps are arranged in a series of multiple circuits. In the example shown there are eleven parallel circuits in series on a 110-volt circuit so that each of these circuits, if the lamps are evenly divided, operates at a pressure of ten volts. Where 20 ten-volt, five-watt tungsten

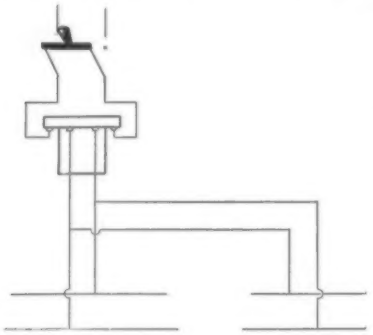


**Fig. 4.—Transformer Circuit.**

sign lamps are used in each parallel circuit, ten amperes would be required.

$$\frac{\text{Watts}}{\text{Volts}} = \frac{20 \times 5}{10} = \frac{100}{10} = 10 \text{ amperes.}$$

Eleven circuits at 100 watts each would mean a total of 1,100 watts (10 amperes × 110 volts) for the main circuit.

One defect with the multiple-series circuit is that burning out of one lamp causes more current to pass through the others of that circuit. The 10 amperes for instance, in the above example will flow if all the 20 lamps burn or if only a few have burned out. Burned-out lamps should be replaced at once by lamps of exactly the same kind and voltage.

For alternating-current sign systems low-voltage transformers are used. The primary wires are connected to the main current supply and the low-voltage secondaries are connected to the sign lamp multiple circuits. Note that in the Fig. 4 the main switch is located behind the transformer so that when this is opened the transformer and lamp equipment is out of circuit. Transformer no-load losses are thereby eliminated.

By the use of transformers, low-voltage lamps and other low-voltage apparatus can be used without the necessity for multiple-series circuits as for direct current. The lamps can be connected in simple multiple circuits. This means, however, heavy current loads where many lamps are used. If a hundred 10-volt, five-watt lamps are used 50 amperes of current will have to be supplied. It is, therefore, advisable to use sufficiently large leads to the sign and for large signs to install several transformers so as to split up the large currents and prevent excessive voltage drop.

No. 14 and No. 12 B. & S. gauge wire is used more than wire of any other size for wiring inside the sign from lamp to lamp, but the feeders from the transformers to the sign must be large enough to carry the load without causing excessive drop.

TABLE I.

DATA ON SIZE OF FEEDERS FOR SIGNS.

Maximum number of ½-ampere lamps that can be supplied by feeders of various lengths and gauges with a drop not in excess of 0.2 volt.

| Length of Feed's in feet. | Size of feeder wires (pair) B. & D. Gauge. | | | | |
|---|---|---|---|---|---|
| | No. 10. | No. 8. | No. 6. | No. 4. | No. 2. |
| 0-3 | 64 | 92 | 130 | 184* | 262* |
| 4 | 50 | 77 | 125 | 184 | 262 |
| 5 | 40 | 62 | 100 | 158 | 254 |
| 7 | 28 | 44 | 71 | 113 | 181 |
| 10 | 20 | 31 | 50 | 79 | 127 |
| 15 | 13 | 21 | 33 | 53 | 85 |
| 20 | 10 | 15 | 25 | 39 | 63 |
| 30 | 7 | 10 | 17 | 26 | 42 |
| 50 | 4 | 6 | 10 | 16 | 25 |

*Number of lamps limited by the allowable carrying capacity of the wire.

### Three-Wire Circuits.

The three-wire method of distribution used on direct-current systems, and on single-phase, alternating-current systems also to some extent, provide means for a more economical transmission of current than a two-wire system.

The current in amperes that a wire can carry does not depend upon the voltage. A conductor that can carry 25 amperes at 110 volts, can also carry 25 amperes at 220 volts. The watts delivered in the second case, however (25×220=5,500), is twice that in the first case (25×110=2,750). If we have 8,800 watts to deliver by means of a two-wire circuit, at 110 volts, disregarding distance and the drop allowed, No. 2 rubber-covered wire would be satisfactory (see table of allowable carrying capacities). If the same wattage were to be transmitted over a 220-volt, two-wire circuit, No. 6 wire, which is, of course, smaller and cheaper, could be employed, as the amperes would only equal 8,800 divided by 220, or 40.

Early multiple circuits were in practically every case built for the standard 110-volt lamps. When the current was to be carried greater distances a higher voltage (220) was tried, two 110-volt lamps were placed in series. But if one lamp failed out the other also went out. This condition soon led to the adoption of the three-wire system, the evolution of which is shown in Fig. 5.

Three-wire systems are used for distribution generally in the downtown sections of cities and also in large

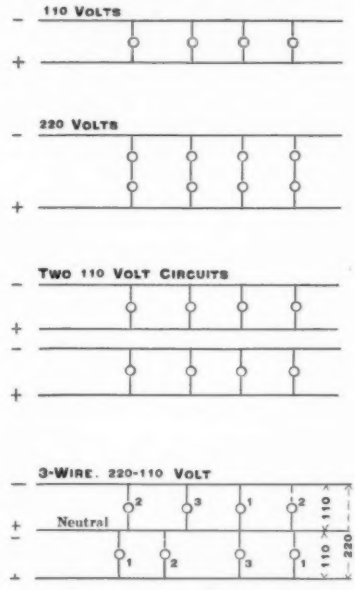



**Fig. 5.—Evolution of Three-Wire System.**

buildings where 110-volt service is desired for lamps, heating devices, etc., but where advantages of higher voltages for economy in distribution and for motor service may be required.

In the three-wire circuit, bottom of Fig. 5, suppose that at the points indicated (which may be different parts of the same floor or on separate floors) that lamps, fixtures or outlets consumed the amperes indicated. When the number of amperes is the same on each side of the neutral no currnt will flow in it. In the case given there is eight amperes on one side and seven amperes on the other; the difference, or one ampere, would flow in the neutral. It is therefore best to arrange the circuits so that nearly the same amount of current is used in both branches at the same time.

In interior three-wire systems the neutral is generally the same size as

the outer conductor and when this is the case and the neutral is grounded the fuse in the neutral wire may be omitted. By using a neutral equal in carrying capacity to the sum of the outer wires the system can be changed to two two-wire systems. This may become desirable in the case of a small plant where emergency connections are made to an electric company's three-wire mains. Branch circuits are two-wire as shown in Fig. 6.

**Drop in Voltage in Lighting Circuits.**

In direct-current circuits the voltage drop in a conductor of any given size depends only upon the number of amperes passing along the wire and upon the length of the run. This rule may be applied also without appreciable error in the calculation of such alternating-current circuits as are met with in ordinary wiring practice. A small wire has a greater resistance than a larger one and hence for the same number of amperes the voltage drop per foot length will be greater than in

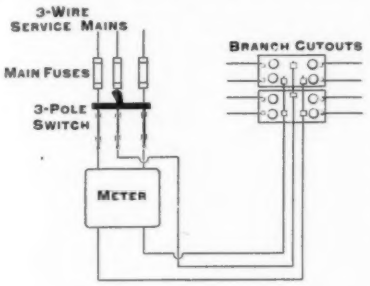



**Fig. 6.—Branch Circuits.**

the smaller wire. As to the relation between length of conductor and voltage drop, it must be borne in mind that the drop increases with the length of the circuit.

It is a matter common to the experience of all electrical workers that the greater the length of current the larger the wire needed to carry it. It is likewise true that the watts delivered at any point along a circuit may be increased by increasing either the voltage or the amperes; or, in other words, for a given wattage if the voltage is high the current will be correspondingly small. The reason, then, why high voltages are generally used on long-distance transmission lines is apparent: it permits the transmission of large amounts of electric power at relatively small currents and thus makes possible the use of comparatively small and inexpensive conductors without involving excessive drop of voltage in the line. Another illustration of the advantages made possible by the foregoing relations is seen in the fact that the larger electric motors are often wound for 2,000 to 2,200 volts so as to remove the necessity for very large leads to supply them with power.

The numerical relations between some of the quantities mentioned above are shown in the following equations which are found very useful in the practical calculation of circuits.

$$\text{Voltage drop on direct-current or single-phase alternating current lighting circuit} = \frac{C \times 2L \times \text{Watts}}{\text{C. M.} \times \text{Voltage.}}$$

C=11, a constant; L=length of conductor; C. M.=circular mils (see table).

Example: Voltage at meter, 110; eleven 60-watt lamps, 100 feet from service entrance; No. 14 B. & S. gauge wire used (4,100 C. M.).

$$\text{Voltage drop} = \frac{11 \times (2 \times 100) \times (11 \times 60)}{4{,}100 \times 110} = \frac{11 \times 200 \times 660}{4{,}100 \times 110} = 3.2.$$

Lamps therefore get only approximately 107 volts.

This 3.2 volts is 3 per cent of 110 volts. Carbon filament lamps, decrease in candlepower six per cent for each one per cent drop in voltage. Hence, 110-volt, 16-candlepower lamps of this type would give at three per cent a line drop between 12 and 13 candlepower.

VOLTAGE DROP FOR VARIOUS SIZES OF WIRE AT VARIOUS DISTANCES AND VOLTAGES CARRYING SIX AMPERES.

FOR 110-VOLT CIRCUITS, D. C. OR A. C. SINGLE-PHASE 2-WIRE LIGHTING CIRCUIT.

| Distance in feet, one way. | No. 14, 4,107 Cm. | No. 12, 6,530 Cm. | No. 10, 10,380 Cm. | No. 8, 16,510 Cm. | No. 6, 26,250. |
|---|---|---|---|---|---|
| 30 | 1.0 | .6 | ... | ... | ... |
| 50 | 1.6 | 1.0 | .6 | ... | ... |
| 75 | 2.4 | 1.5 | 1.0 | .6 | ... |
| 100 | 3.2 | 2.0 | 1.3 | .8 | ... |
| 125 | 4.0 | 2.5 | 1.6 | 1.0 | ... |
| 150 | 4.9 | 3.0 | 1.9 | 1.2 | ... |
| 200 | 6.5 | 4.0 | 2.5 | 1.6 | ... |
| 250 | 8.0 | 5.0 | 3.2 | 2.0 | ... |
| 300 | 9.6 | 6.0 | 4.0 | 2.5 | ... |

FOR 220-VOLT CIRCUITS.

CURRENT, THREE AMPERES.

| | | | | | |
|---|---|---|---|---|---|
| 50 | .8 | .5 | ... | ... | ... |
| 75 | 1.2 | .7 | ... | ... | ... |
| 100 | 1.6 | 1.0 | ... | ... | ... |
| 125 | 2.0 | 1.25 | ... | ... | ... |
| 150 | 2.5 | 1.5 | 1.0 | ... | ... |
| 200 | 3.2 | 2.0 | 1.3 | ... | ... |
| 250 | 4.0 | 2.5 | 1.6 | 1.0 | ... |
| 300 | 4.9 | 3.0 | 1.9 | 1.2 | ... |
| 400 | 6.0 | 4.0 | 2.5 | 1.6 | ... |
| 500 | 8.0 | 5.0 | 3.2 | 2.0 | 1.25 |

The values in the above tables are computed for six and for three amperes, respectively, in view of the requirement in the National Electrical Code limiting the load on a single fuse in interior wiring to 660 watts, these being the currents corresponding at the two respective voltages to that wattage. The drop for any other value of current can be readily found, of course. For example, if the current were 12 amperes, the drop in a 110-volt circuit would be twice as great as the value given in the table; while 12 amperes in a 220-volt circuit would cause a voltage drop four times as great as that given here.

**Weight of Copper.**

The weight of copper used for making a wire one inch in diameter and one foot long is 3.028 pounds. One foot of No. 2 B. & S. gauge, which is about one-quarter inch in diameter (see table), weighs a little less than one-fifth of a pound (3.028/16=0.19 lbs.). That is the weight varies as the square of the diameter of the round wire.

C.M.×L×.000003028=lbs. wt. of copper wire.

C.M.=Circular mils as given in table.

L=Length in feet.

The weight of 500 feet of No. 6 wire equals 26,250 × 500 × .000003028 = 39.74 lbs.

From the table it will be noted that multiplying the figure in column I (diameter in inches) by 1,000, and squaring the result gives the circular mils in column II. For example, No. .000 is 0.46 inch in diameter;

0.46×1,000=460 mils.

$460^2$ or 460×460=211,600 circular mils.

**Insulation.**

The common forms of insulating materials are marble, slate, glass, mica, porcelain, asbestos, paper, rubber and rubber substitutes, and gutta percha; besides other compounds marketed under trade names. The perfect insulating material would not be affected by heat, age or moisture and its insulating value would remain constant. Insulations of several kinds are used on wires. These consist usually of rubber or rubber compound, weatherproofed braid, slow-burning or fireproofed braid, and fireproofed and weatherproofed braid. Rubber-cov-

ered wire is made both single-braided and double-braided. The second braid is put on for wire which is used in conduit or wherever an especially tough insulation is desired.

In conduit one braid is not considered sufficiently strong to protect the insulation when wires are being pulled into the pipe. The thickness of the insulation varies with the size of the wire and also depends to some extent upon the voltage of the circuit on which it is to be used. The insulation of No. 14 to No. 8 wire for voltages up to 500 is three-sixteenths-inch and from No. 6 to No. 2, one-sixteenth-inch; while for larger wires it runs from three-thirty-seconds-inch upwards. On removing the insulation of a rubber-covered wire it will be noticed that the wire itself has a tinned coating. This is applied during manufacture to prevent attack of the copper by materials used in the insulation. The characteristic copper color will be exposed upon scraping the tinned surface of the wire with a knife.

Rubber-covered wire can be used for practically any kind of wiring except where the conductors will be subjected to excessive heat, as when passing over an oven or in the vicinity of any other heat source. Here the insulation might be dried out and become valueless. But rubber-insulated wires can be used for open-knob or cleat systems and must be used for knob and tube systems, molding systems and, when provided with double braid, for conduit systems.

Slow-burning weatherproof wire has two coatings, the inner one, weatherproof and the outer one, fireproof. The braid of the inner coating is saturated with a moisture-proofing mixture and the outer coating is filled with a fire-resisting compound.

Slow-burning wire has several braids filled with a fire-resisting compound and has a strong outer braid, which is finished smooth. The last two wires mentioned are used to a great extent for open cleat wiring in hot, dry places.

Weather-proof wire has all its braids filled with a moisture-proofing compound, and has a smooth outer finish. This wire can be used for open wiring, especially where acid vapors are present, and for outside wiring. Where a large number of wires are grouped in open style wiring, it is best to use as little rubber-covered and weather-proof as possible, as both have insulations that burn easily and with a dense smoke.

ALLOWABLE CARRYING CAPACITIES OF COPPER WIRES AND OTHER DATA.

| B. & S. Gauge. | Diameter, Inches. | Circular Mils. | Amperes, Rubber Insulation. | Amperes, Other Insulations. | Resistance per 1,000 ft. at 75° Fahr. | Weight per 1,000 ft. |
|---|---|---|---|---|---|---|
| 18 | .040 | 1,625 | 3 | 5 | 6.21 | 4.5 |
| 16 | .050 | 2,583 | 6 | 8 | 3.97 | 7.8 |
| 14 | .064 | 4,106 | 12 | 16 | 2.53 | 12.5 |
| 12 | .080 | 6,530 | 17 | 23 | 1.589 | 19.8 |
| 10 | .101 | 10,381 | 24 | 32 | 1.000 | 31.5 |
| 8 | .128 | 16,510 | 33 | 46 | .63 | 50.0 |
| 6 | .162 | 26,250 | 46 | 65 | .392 | 79.0 |
| 5 | .181 | 33,100 | 54 | 77 | .31 | 100.0 |
| 4 | .204 | 41,740 | 65 | 92 | .248 | 126.0 |
| 3 | .229 | 52,630 | 76 | 110 | .197 | 159.0 |
| 2 | .257 | 66,370 | 90 | 131 | .157 | 200.5 |
| 1 | .289 | 83,690 | 107 | 156 | .123 | 253.0 |
| 0 | .324 | 105,500 | 127 | 185 | .099 | 319.0 |
| 00 | .364 | 133,100 | 150 | 220 | .077 | 402.0 |
| 000 | .409 | 167,800 | 177 | 262 | .063 | 506.0 |
| 0000 | .460 | 211,600 | 210 | 312 | .05 | 640.0 |
| .... | .633 | 400,000 | 330 | 500 | .025 | 1,211.0 |
| .... | .708 | 500,000 | 390 | 590 | .02 | 1,514.0 |
| .... | .774 | 600,000 | 450 | 680 | .0168 | 1,817.0 |
| .... | .836 | 700,000 | 500 | 760 | .0143 | 2,120.0 |
| .... | .895 | 800,000 | 550 | 840 | .0125 | 2,422.0 |
| .... | 1.000 | 1,000,000 | 650 | 1,000 | .0100 | 3,028.0 |
| .... | 1.095 | 1,200,000 | 730 | 1,150 | .0084 | 3,635.0 |
| .... | 1.180 | 1,400,000 | 810 | 1,290 | .0071 | 4,240.0 |
| .... | 1.224 | 1,500,000 | 850 | 1,350 | .0066 | 4,545.0 |
| .... | 1.264 | 1,600,000 | 890 | 1,430 | .0062 | 4,840.0 |
| .... | 1.342 | 1,800,000 | 970 | 1,550 | .0055 | 5,450.0 |
| .... | 1.413 | 2,000,000 | 1,650 | 1,670 | .0050 | 6,056.0 |

For insulated aluminum wire the carrying capacities are 84 per cent of the above values.

### Flexible Cord.

The ordinary flexible cord used with with pendant sockets, switches, etc., consists of two conductors. Each of these is made up of many smaller wires, which make the cord more flexible than if solid conductors were used. The small strands are usually No. 26, No. 28, or No. 30 B. & S. gauge. A close weave of cotton is bound around these strands so that in case any become broken, they will not pierce the insulation. The cotton also keeps the rubber insulation from direct contact with the wire. An outer braid of heavier cotton or for some uses, silk, is woven around each insulated conductor. The conductors are usually twisted about each other although in some cases they are laid flat, side by side and an outer braid woven about both.

The flexible cord described above must be used only in such lengths and in such places that at all times it will hang freely in the air. It should not be strung around on nails, hooks, over beams, piping, etc. For portable desk lamps, fans and devices used in the office or household, a special cord is used. This has, in some cases an extra insulation around the two conductors but usually is like the pendant flexible cord with an outer braided cover over the whole.

Re-inforced flexible cord is used for portable lamps, heating devices, motors or wherever the cord is liable to receive rough usage. This cord is made up of the ordinary cord with an outer rubber insulation one-thirty-second inch to three-sixty-fourths inch thick, the whole having a tough braid of cotton woven about it. When this cord is used with portable lamps, a socket threaded for three-eighths-inch pipe should be used, provided with a socket bushing. For ordinary flexible cord a socket threaded for one-eighth-inch pipe can be used.

Three sizes of cord are in greatest use, Nos. 18, 16 and 14 B. & S. gauges. Flexible cord can be used on systems where the voltage does not exceed 300.

All interior wiring, particularly flexible cord and fixture wiring, should conform to the requirements of the National Electrical Code, and the specifications established by the local inspection bureau. Approved material should be sought for and installed, in order to eliminate the fire hazard in every instance possible.

### Use of Conduit Required.

The requirements of the Bureau of Electricity of Pittsburgh, Pa., relative to interior wiring have recently been amended so as to insure conduit construction in the wiring of certain classes of buildings in the city. It is provided that all buildings used for schools, auditoriums, churches, places of amusement, apartments, warehouses, office buildings and places of business must be wired with either flexible or rigid conduit or with approved armored conductors. Other kinds of wiring will not be approved.

An English magazine tells of an installation in which the leads of an induction motor having a wound rotor were brought out through the frame of the machine without bushings. The insulation soon wore off and they were short-circuited on the iron, with the result that the leads were destroyed and the starting of a fire made imminent.

In the first six months of 1911 the exports of copper from Mexico were 352,070,445 pounds, over half of which was shipped to Holland and Germany.

## SOME HAZARDOUS WIRING AND HOW IT WAS IMPROVED.

By H. G. Wilson.

In the inspection of the electrical equipment of some grain elevators of the old wooden type recently, the existing conditions were found to be extremely hazardous; the wiring being very unsafe. It is interesting to note, moreover, the defects seen were practically common to all of the houses inspected. In most cases the insulation on line wires cracked, or even fell off, whenever the wires were disturbed; the supports of the conductors were found to be insufficient, and

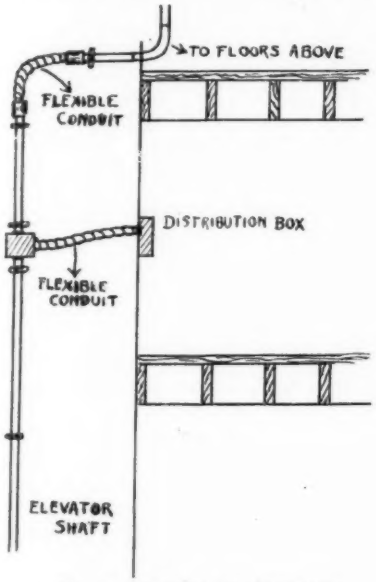



Fig. 1.—Branch Connections.

the wires not properly spaced; defective drop cords were in frequent evidence; there were long lines of this supported by means of nails driven into walls or ceilings; joints were not soldered at all, and only once in a while were any of them taped; there were unanchored taps, and a conspicuous absence of bushings where wires crossed each other on ceilings, walls and partitions; defective cutouts were installed in still more defective wooden cabinets; there was open wiring in stairways, elevators, shafts and numerous other places in which conductors were exposed to mechanical injury; and, to make matters still worse, circuits were often overloaded and likewise overfused. Conditions were so very bad, in fact, that the inspection board strongly urged entire new conduit installations; but supposed high cost of such changes led the owners to decline to give them any very serious consideration. Therefore, compromises had to be effected. The general character of these compromises is described in the following notes. It is interesting to note in passing, however, that the changes actually made proved to be about as expensive as the complete conduit installations would have been.

All wiring in shafts, stairways, basements and rope drives, and also on side walls and in all other places where the wiring is liable to mechanical injury, was placed in approved metal conduit. Branch feeders in elevator shafts were arranged as indicated in Fig. 1. At the junction of each of these branch circuits six feet of flexible conduit was inserted in order to allow for the rise and fall of the structure, which usually accompanies the unloading and loading of bins. A similar provision was also made at right-angle bends in conduit. All conduit risers were securely fastened with extra heavy pipe straps in such a way as to permit free vertical movement. As a means of insuring the secure fastening of junction, pull and outlet boxes so that they may not be affected by the rise and fall of portions of the building, conduit connections of unusually heavy construction were used throughout. Moreover, in order to avoid any possible fusing of branch circuits in the elevator shafts, the branch feeds were made the same size as the mains to the distributing centers on the various floors. For the old wooden cutout cabinets there were substituted approved cabinets made of No. 12 gage metal with doors overlapping one inch. Instead of spring catches, which are liable to get out of order, each door was provided along its bottom edge with a heavy strip, the weight of which, combined with that of the door itself, was sufficient to keep the latter tightly closed.

Wherever open wiring entered cutout cabinets the conductors were first heavily taped at the bushings and then covered with an insulating compound so as to exclude dust. All line wires on which the insulation had become defective were replaced with new wires, and where flexible cord had to be used at all No. 14 rubber-covered stranded cord, or approved No. 14 reinforced drop cord, or rubber-covered flameproof No. 14 stranded cord was used. All drop cord was soldered to the switch terminals.

All porcelain link fuse cases were replaced with cartridge or plug fuse

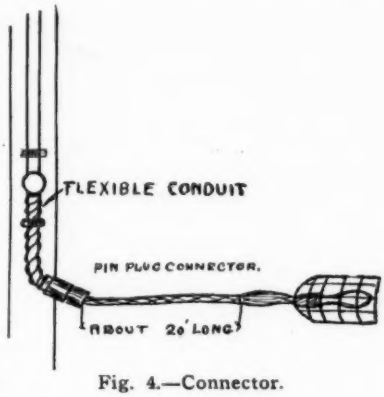
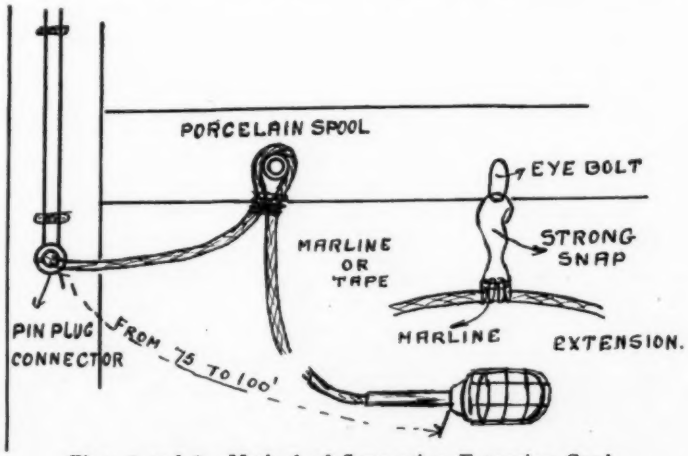



Fig. 4.—Connector.

blocks, and all wire connections to the screw terminals of these were soldered so that the contacts cannot possibly become loose as a result of vibration. For the lamp sockets found in use there were substituted sockets of an approved keyless type. When the wires were placed in one of these latter sockets the space around the wire was fitted with tape and an insulating compound so as to exclude dust effectively from the inside of the socket. Approved weatherproof sockets having vapor-proof globes were required to be used on all lamps in basements. Guards were required for any incandescent lamps liable to be broken, and drop lights were anchored either with single wire cleats or with No. 4½ split knobs.

All joints were required to be properly soldered and taped and then com-




Figs. 2 and 3.—Method of Supporting Extension Cord.

pounded with P. & B. or with Chatterton compound. This compounding keeps the friction tape from drying out and unwrapping, of course. The switch lengths were run in conduit and all snap switches were mounted in outlet boxes in such a way as to leave only the key of the switch exposed.

Special attention was given also to extension circuits, particularly those used in connection with unloading cars and bins. The bin extensions had in all cases to be from 75 to more than 100 feet long, and these are used for lighting and also in measuring the depth of grain in the bins. It was generally found that in making these extensions a number of lengths of ordinary drop cord had been joined together by means of joints made without any solder or tape whatever, pieces of twine having been used in place of tape. Attachment blocks were found made of pieces of broom handle about 3 inches long. The plug had been constructed by drilling a ¼-inch hole through the center of the piece of wood parallel with its length, and nailing a lamp base on the end of it. One wire was run through the hole in the center and soldered to the center of the base, and the other was held between the nail and the base itself on one side of the latter. This condition was remedied by requiring the extensions for the bin floors to be all made of No. 14 reinforced cord and each extension equipped with vapor globes, handles and guards, and also with approved attachment plugs with 3/16-inch openings properly taped and compounded. It was further required that these extensions be rigidly anchored according to the plan indicated in Fig. 2, or else in the manner shown in Fig. 3, or by some equivalent plan for taking the strain off of the attachment receptacle. For unloading cars it was recommended that a pin-plug connector and an extension of reinforced No. 14 flexible wire equipped with a 3/16-inch brass keyless socket and a substantial lamp guard be provided for each "unloader," the arrangement to be as shown in Fig. 4. Such a scheme as that shown in the figure referred to obviously safeguards connectors against injury in case the extensions should be forgotten when the car is to be moved. Extensions throughout, the buildings were required to be the same as those for bins except that 3/16-inch brass keyless sockets were not always insisted upon. Attachment plugs were generally recommended wherever by using these the use of lamp sockets could be avoided.

During the inspection of the building prior to the repairs on the wiring just considered, it was found almost without exception that fuse and switch contacts were quite warm—in some instances hot, in fact. This condition was thought to be due to dust accumulations, and was remedied by installing material just twice as heavy as would have been required by the current carried.

The foregoing changes having been made, the electrical construction in these grain elevators, although not so substantial and durable as might have been obtained by means of complete conduit installations, to be sure, appears to be satisfactory and on the whole quite safe. Before the repairs, however, the fire risk was certainly great.

### Henry Newgard.

Henry Newgard, the subject of this sketch, came to Chicago from Norway, his native country, in 1879, at the age of twenty-one. Prior to his arrival in America he had received a country-school education and had completed an apprenticeship as locksmith, blacksmith and bell hanger, these three classes of work being considered parts of the same trade in the land from which he had come. For nearly four years he worked at his trade in various Chicago shops, and in the meantime industriously devoted his spare hours to the study of electricity. In 1882 he rented a small shop and went into business for himself as a locksmith and electrician. After ten successful years of this occupation, he gave up the former line and turned his attention exclusively to electrical contracting. In this field, high-class work and careful, conscientious attention to his affairs caused his business to increase steadily, making it necessary for him to move from larger to still larger offices in the downtown district.

Henry Newgard.

By 1902 Mr. Newgard's business had grown to such proportions that he decided to form a corporation for an even more extensive prosecution of electrical contracting and construction. The firm of Henry Newgard & Company was therefore organized with Mr. Newgard as president, Martin Newgard, his brother, vice-president, and Charles Edward Browne, secretary. The company has commodious quarters at the corner of Morgan street and Washington Boulevard, Chicago. In addition to contracting it is engaged in the manufacture of switchboards, panel boards, steel cutout cabinets, and waterproof receptacles and globes. They also do a large amount of dynamo and motor repairing and install complete lighting and power plants.

Mr. Newgard's company is a member of the Electrical Contractors' Association of Chicago, the Electrical Contractors' Association of Illinois, the National Electrical Contractors' Association, the Chicago Association of Commerce, the Manufacturers' and Dealers' Association of Chicago, and the Building Construction Employers' Association of Chicago.

Mr. Newgard is a member of the Builders' Club of Chicago, the Electric Club of Chicago, and the Rotary Club of Chicago. He is past-president of the Electrical Contractors' Association of Chicago, and the Electrical Contractors' Association of Illinois. He is director and treasurer of the Universal Pneumatic Transmission Company, and a director of the American Electrical Supply Company and the Sheridan Trust and Savings Bank. Mr. Newgard is also a Jovian, a Thirty-second Degree Mason, a Knight Templar and a Shriner. He lives on Newgard Avenue, Chicago, and is a Commissioner of the North Shore Park District.

A recent number of *The Mechanical Engineer* (London) reports a case in which it was found impossible to keep the voltage of a certain direct-current dynamo up to the normal during runs of any considerable duration. The drop in voltage was always accompanied by excessive heating of the field coils. Examination disclosed the fact that the insulation had become saturated with oil because the attendant had been in the habit of flooding the bearings whenever he filled them with clean oil. The insulation was thus made so defective that neighboring coils of the field winding had become short-circuited on each other. The field spools had to be re-wound.

### Canadian Water-Power Resources.

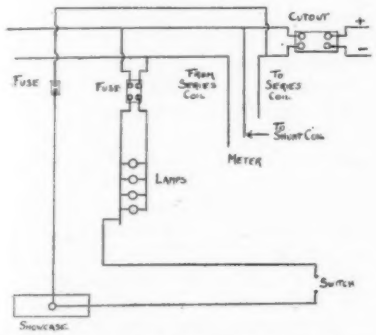
The recent report of the Commission of Conservation of Canada states that there is an aggregate of over 21,000,000 horsepower developed and develo pable water power in the inhabited provinces and territories of Canada. Less than five per cent of this has been developed. Many remote sections of Labrador, Ontario, Northwest Territories, British Columbia and Yukon have not been taken into account in this summary.

# Dollar Wiring Kinks.

**Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will immediately be sent to the contributor.**

### Beating the Meter.

We occasionally have customers who have their windows and entrances wired, who do not like the flat-rate system, but who after using the meter rate for a month decide to change to flat rate for windows alone, and they call on us to devise a means to that end. In one installation we had a show case to connect from beneath the sidewalk, and while installing the work




**Wiring to Avoid Meter Registration.**

the man added three drop lights in the basement for lighting on the same circuit. The show case was on a switch in the office near the cabinet, and it was therefore necessary to pull three wires in the conduit to obtain the desired result, leaving the drop lights independently connected. Our customer wanted to have his show case connected on flat rate on a switch near the door, and, as the conduit line had so many ells in it that we could not get three wires out to pull in the fourth, we devised the scheme of wiring shown in the accompanying sketch. It was found that with this arrangement the current taken by the show-case lamp did not affect the meter at all.

J. Howard Bothwell.

### Locating a Ground in Conduit.

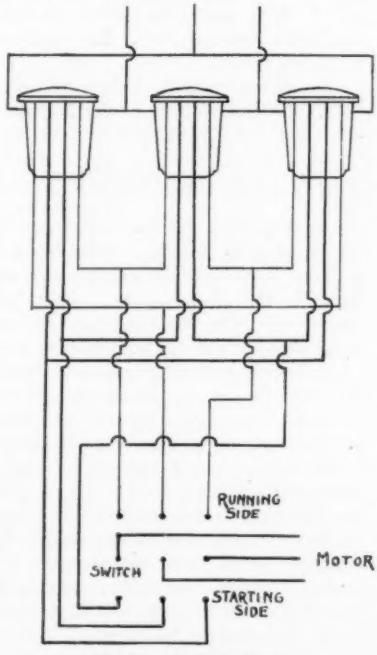
During my experience as a wireman and repair man this week, I made use of a plan of my own which saved me a lot of time. As I believe it will be valuable to others, I am offering it here.

Having discovered a ground on a 110-volt lighting system, I proceeded as follows to locate it. I removed one plug from one side of the cutout block and allowed the lights to burn dimly through the ground for several minutes. I then felt along the conduit with my bare hands till I came to where the conduit was very warm, thus locating the exact point of trouble.

W. A. Hines.

### Starting Induction Motors Without a Compensator.

I have recently seen an installation in which what seemed to me to be a very unusual method was employed for starting induction motors. The transformers used for stepping the voltage of the line down to that of the motor were equipped with special taps for supplying a pressure about half the running voltage of the machine. These taps were carried to one side of a double-pole switch, to the other side of which the running leads of the transformers were connected. The motor




**Motor Connections.**

leads were connected to the middle points of the switch. The switch was thrown to the low-voltage side at starting, and reversed as soon as full speed had been attained. The arrangement of the circuits is indicated in the accompanying diagram.

J. S. Colburn.

### A Handy Attachment Plug.

An attachment plug that will answer the purpose of the ordinary plug where appearance is not a matter of much importance, can be made with little or no expense, as follows. Procure an old tungsten or other lamp having a skint or brass ring above the base; break off all the bulb down even with the top of the base, and also the tube in the center. Splice the ends of a lamp cord to these wires, taking care that the splice and also the insulation on the cord is well below the top of the base, and also careful that the wires do not touch any part of the brass base. After this is done all that is necessary to complete the job is to pour the base full of melted wax, which can be obtained from the top of a worn-out dry battery.

Harry Strag.

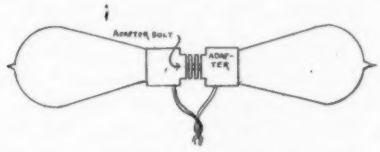
### Keeping the Float from Freezing.

In many of the smaller electric pumping stations, pumps are started automatically by means of switches operated by floats. A good way to keep these from freezing up is to inclose them in a vertical iron pipe of the proper length and size and keep the water within the pipe covered with oil to a depth of six inches or so. I have found this plan very effective.

C. W. Goddard.

### A Simple Test Lamp.

A simple way to make a very good and at the same time inexpensive test lamp for 110 and 220-volt circuits is to take two T. H. adapters and place them together end to end, as shown in the cut, with about three or four layers of mica or a fiber washer between them; then put a small stove bolt through the center; next solder the




**Test Lamp.**

end of lamp cord to the shells of the adapters as shown, and you have as small and compact a test lamp as can be made. This can also be used for light around cabinets, cutouts, etc.

E. W. Dullea.

A type of fitting which is growing in popularity is that which consists of a large ceiling plate from which can be dropped a number of lights. To make a plate in one piece, such as is commonly used, entails considerable expense, as the size of metal necessary is very large, and handling amounts to a considerable item, making the cost of the finished fixture rather high. This plate, however, can be made from a number of similar pieces of smaller sized metal so joined together that the places of joining form ribs on the inside of the fixture, giving it additional rigidity and reducing the cost.

# National Electrical Inspectors' Association

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## The Secretary's Message.

The matter in this issue, which has to do with only one question, is of considerable importance and great interest. Because of the nature of the question, it was not sent to all members of the committee; but only to certain members whom the secretary considered, on account of their positions, to be peculiarly qualified to deal with it, and to about four other gentlemen not on the committee. One or two of those to whom the question was sent replied that they did not feel sufficiently in touch with the peculiar conditions in the large cities to discuss the matter, and preferred, therefore, simply to say "No field experience," and let it go at that. It appears, however, that those who did send answers in have given us valuable information and much food for thought. The letter which accompanied the question stated that the replies would probably form the basis of a larger symposium. The Secretary earnestly desires that any person interested in the subject under consideration, whether a member of the Association or not, will feel at liberty to give us the benefit of his views and experience. We shall certainly make use of them, and they will doubtless prove of value to us all. Let us hear from you.

The Secretary also desires to suggest that the members of the Association send him from time to time any questions relative to any other matters concerning electrical inspection which may occur to them and which they may consider helpful or interesting to others. You can be sure that such material will always be welcome. One often thinks that some little paragraph wouldn't be interesting to anybody else at all, when the fact of the case is that if he would only send it in for discussion, he would find that to many of the men in the fields of electrical construction and inspection the matter would prove most valuable. Even if you have nothing else to submit, there must be some questions concerning the new edition of the Code which you would like to see discussed.

## Concerning Underground Service Connections.

**Ques. 158. Rule 17 (*d*) of the Naonal Electrical Code requires that "No underground service from a subway to a building shall supply more than one building, except by written permission," etc. I should like to see a discussion of this rule by some competent authority, with reasons in full for its adoption. What constitutes a "building" within the intent of this rule, and how is a "subway" defined? In the case of several adjoining stores under one roof, but separated by brick walls, have we in effect one building or several? What is the objection to running through even a fire wall between separate but adjoining buildings, if a continuous iron conduit system be employed, with the conduit tightly cemented in where passing through the dividing wall, each occupant being provided with his own independent service switch and cutout? Where street distribution is by means of Edison tubes, does the rule contemplating subways apply? How about services entering from a manhole, the manhole being supplied by underground ducts of tile or iron pipe? Many cases exist where the manholes are so far apart that possibly a dozen adjoining buildings must be supplied from each manhole. Is it required that a dozen parallel ducts must be laid back to the manhole? In some cities, New York for instance, one underground service is allowed to supply several buildings provided the conduits are not carried directly through the intervening wall, but around it at the front or the back so as to pass outside of the building before entering adjoining property. What material advantage is gained by this requirement and what serious objection can there be to the running of a small closed pipe, seldom exceeding two inches in size, through even a fire wall if no opening exists around the pipe and the pipe system beyond the wall is of sufficient length (not necessarily very great) to insure that no fire could possibly be carried through it to first opening in the second building?**

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Ans. 1. Rule 15 (*d*) National Electrical Code, edition of 1909, now Rule 17 (*d*), edition of 1911, applies here. The word building as used in this rule refers to an edifice or fixed structure into which electrical conductors are brought. A building may be considered as being separate from others under the two following conditions: (1) When isolated from any other building by a portion of ground on which no building is situated. (2) When separated from other buildings that may be directly attached to same by a solid fire wall of approved construction, extending from the earth on which the foundation rests through all floors and through the roof where it should form a parapet. The space between two such fire walls may be considered as being a separate and distinct building.

The word subway as used in this rule refers to a passageway for electricity over conductors that are below the surface of the earth. A subway may be an accessible passageway extending from one point to another into which the electrical conductors are placed. Or it may be a wire way of dust construction (accessible at manholes, handholes, etc.) into which the conductors are drawn. Or it may be buried conductors (Edison tube) completely covered with earth.

As to services entering buildings from manholes, in this jurisdiction this is uncommon, as the system is Edison tube mains, making use of braided lead-encased cable services, without ducts, the services connecting to the mains at splicing boxes directly in front of the building to be supplied. To make the connections, it is, of course, necessary to dig up and bore under the street and sidewalk.

Now a word as to permitting electric companies to install mains through separate buildings. Not considering the increased fire hazard that such practice would bring about from the many conditions that could and no doubt

would arise, but considering it from the viewpoint of the electrical companies themselves, the writer believes that it would not work out to their satisfaction. A few of the numerous objections are as follows: The electrical companies would be placing themselves under obligations to the property owner and occupant, who may be a non-user of current and in no manner an interested party. Then there is the possibility of interruption of service to a number of consumers through the action either accidental or wilful of the owner or the occupant, improper supervision in buildings that may be vacant and locked must also be taken into account. Impossibility of disconnecting current from buildings in time of fire or after without depriving a number of other consumers of the use of current might also prove a serious matter. In view of these and other disadvantages almost sure to result, the writer, as already intimated, would not encourage making service connections in the way suggested.

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Ans. 2. Code Rule 15 (*d*) has never been adopted by this city, it being in conflict with the city ordinance governing the same subject. The matter has, however, been covered by city ordinance as before mentioned. The original ordinance of the Department contained the following:

Each building, into which electric current shall hereinafter be introduced, shall have independent service from the street or alley, entering at right angles with the street curb; and no wires hereafter put up shall pass from one building to another, through any party wall or along any building wall or over any roof or under any sidewalk.

The intent of this ordinance was to provide an independent service extending into each building.

In 1905 the Code was revised and the Corporation Counsel changed the wording of this section of the ordinance, claiming that the requirements could not be legally enforced, and the ordinance was amended to read as follows:

Each building, into which electric current shall hereinafter be introduced, shall have independent service from the street or alley, entering at right angles with the street curb; except where the service wires are placed in conduits complying with the rules of the Department of Electricity; and no wires hereafter put up shall pass from one building to another, through any party wall or along any building wall or over any roof or under any sidewalk except where such conduits are used.

You will note that the alterations in the wording allow service wires to pass from one building to another through party walls if they are installed in conduits. This would allow a plant in the middle of a block, for instance, to feed the entire block; provided, however, it did not cross any public property.

In this city the space under the sidewalks is considered as part of the street and all companies having franchises allowing them to run wires in the streets are also entitled to run wires under the sidewalk spaces and this practice is followed here. The lighting companies bring their service through the curb wall under the sidewalk space and then feed buildings on either side of this service entrance.

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Ans. 3. It is very difficult to define the word "building" in a practical way. We have endeavored to class as one building all that part of the premises which is inter-communicating, but this does not solve the problem. We have also attempted to consider a building as a structure under one roof and provided with outer walls which will enable the construction to stand alone if adjacent structures are removed. This is not altogether satisfactory. In the end we have been obliged to give up the attempt to make a general ruling and have resorted to considering each individual case on its merits.

"A subway is an artificial passage under or below the level of the ground." We, therefore, define a subway as intended by the Code to be a raceway containing electrical conductors laid underneath the ground at the point where it enters the building. This includes all kinds of ducts and Edison tubes and various types of armored conductors.

The objection to running directly through from one building to supply another with electricity is based upon the following argument.

Electricity, although the safest known illuminant, does certainly introduce a fire and panic hazard of its own. It is unwise, therefore, to permit the introduction of electric light and power circuits into any building where such introduction is not necessary for the supplying of that particular building with illumination or power service; and for the same reason it is just as unwise to permit the introduction into any building of more electric energy than is required for the supply of that particular building.

Three general cases offer themselves for consideration here. First, there is the case in which one building is served from a private plant or general service located in the building immediately adjoining.

There seems to be no overwhelming objection to this procedure, except in so far as it interposes difficulties in the way of proper supervision of the installation by those who may be operating the private plant; or in so far as it tends to encourage the spread of cases 2 and 3.

The second condition is found where the electric supply of one building is obtained from a building not adjacent. In this case the electric circuits are carried through at least two party walls and expose the intervening premises to an unnecessary fire and panic hazard.

The third case occurs where a series of adjoining buildings—perhaps five or more—are all supplied by circuits carried straight through party wall after party wall to supply the entire series. Here we find introduced into each building not merely the amount of electrical energy required for its own needs, but that required for the needs of all buildings beyond it in a direction away from the private plant or general service. If we assume five buildings so connected and each requiring 10 horsepower of electrical energy, it is seen at once that the building next to the one which is furnishing the supply will have introduced into it 40 horsepower of which only 10 is required; the following building will have 30 horsepower, of which only 10 is required, and so on. So that the first building would be subjected to five times the necessary fire and panic hazard, the second building, four times, and so on. Furthermore, the mains running straight through usually occupy the basement, in which may be stored kindling wood, burlap, excelsior and all imaginable kinds of inflammable material. If, then, a breakdown in this main were held in by a heavy fuse, a burning out of the conduit might be expected to cause a fire.

If we fail to prevent the operation of cases two and three, or even if we fail to prevent the first case, there is no way in which we can effectually prohibit the extension of this scheme over an entire block, the electric light and power distribution line ramifying at the will of the owners through and across back yards, *ad libitum*.

In New York we do not prohibit the supplying of one building from another, but we safeguard it by requiring that the conduits containing the electric circuits shall be buried in brick or concrete, and our Rule No. 17 (*d*) reads as follows, the portion in parentheses being that part of the National Code rule which we do not accept, and the portion in italics being our own addition to the rule:

"No underground service from a subway to a building *and no service from a private generating plant* shall supply more than one building *until the plans in connection with such supply have received the written approval of* (except by written permission from the Inspection Department having jurisdiction) *the*

*Commissioner. Where one or more buildings are supplied from another, the conductors are to be carried outside the buildings. Conductors carried under two inches of concrete under a building or buried back of two inches of concrete or brick within a wall are considered as lying outside the building."*

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Ans. 4. We feel that this question of underground services is one of the most important questions with which inspection departments in large cities have to deal. We believe that the present rule prohibiting an underground service to pass through one building to feed another is a wise rule, and is necessary, unless rigid requirements are framed for protecting such underground services. The energy which might be developed by an arc in an underground service pipe is capable of almost any damage which might be caused by fire or explosion. Where several buildings are fed from one underground service, the mains must necessarily be large enough to supply all the buildings, and the failure which finally occurs will be a serious matter, unless some means have been provided to limit the current. One method of overcoming this danger would be to place the conduit underneath, and thus not in the building; or, to accomplish the same effect, have the conduit run along the basement floors or at the bottom of the outer walls and protect the conduit by concrete—the depth under the building, or the thickness of the protecting concrete being made proportional to the size of the conductors carried in the conduit. We believe that some such requirements should be inserted in the Code under Rule 17.

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Ans. 5. Referring to Rule 15 (*d*) 1909 edition of National Electrical Code. (Rule 17 (*d*) in the 1911 edition), we would say that it would seem that there could be no reasonable question, at least from an inspection standpoint, but that this rule is not only warranted, but necessary in the interest of safety to both life and property.

Experience has taught us that large capacity mains and feeders run in iron conduit, which, without question, is recognized as the most approved method of installation, constitutes at times a serious hazard, even when such circuits feed from cutouts with safety fuses of capacity permitted for wires in question, or when another safety device of approved type is installed.

In our large cities many cases occur where with cutouts properly fused, fuses fail to operate promptly when a breakdown in the insulation of the mains occurs in iron conduit, owing to the contact at the point where the short-circuit takes place not being of a carrying capacity that will permit of the passage of sufficient current to operate the safety devices. As a result of this condition of affairs, an electric arc is maintained, conductors and conduit are melted down and a fire is started. This is not an imaginary case, but is one that occurs only too frequently in actual practice. Burnouts of this nature in our underground construction, all of us who have underground construction in our territory undoubtedly are familiar with.

Cases of individual buildings with large electric installations have in the past and will in the future occur, but this would not warrant the inspection interests in eliminating or nullifying a rule intended to prevent the installation within buildings of a system of service distribution from building to building, which system of distribution should be in subways in our streets, where it belongs. If the indiscriminate running of distribution systems through buildings were permitted, the increase would be so great in the size of wires passing through a building over what would be necessary if the wires were of a capacity designed to take care of only the building containing same, as to materially increase the possibility of serious trouble if a breakdown in the insulation of the conductors occurred.

Even though the distributing wires were placed beneath the cemented basements of buildings as has been suggested in the past by some interests involved, this does not in my judgment smooth away the objections to distributing from building to building, as the possibility always would exist of serious explosions similar to what occurs only too frequently in street underground systems where the inspection and care is much greater than you could ever expect to see maintained in any system of distribution from building to building.

Cases may come up from time to time where it is practically necessary and is proper to permit of a feed from one building to another, although we believe such cases are rare. Where such cases do arise, however, the rule which is under consideration permits the inspection department having jurisdiction to give permission covering same.

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Ans. 6. From my reading of this question and the accompanying letter, I gather that something more than the usual brief answer is desired. Taking the different elements of the question up in order, then, we will first consider briefly what constitutes a building within the meaning of the Code. I should say that a building was either a house standing alone and separate from any other structure or else one in permanent physical contact with others but separated from them by means of firewalls giving complete isolation so far as fire is concerned. As to how a "subway" should be defined in the light of Rule 17 (*d*), I believe this to be any raceway below the surface of the earth whereby electric conductors may be introduced into a building.

Where a subway is used there may be an accumulation of gases within the subway which may cause an explosion in a building remote from that in which the gases are produced. Finally, the plan of running circuits in question is quite likely to give rise to complications of a more or less perplexing nature between central stations and consumers and others.

Relative to making services in sections where Edison tubes are employed in electric distribution, it seems to me that the Code requirements concerning subways should apply here; also that the Code should be followed as nearly literally as is consistent with reason in making service connections from manholes.

The statement in Question 158 to the effect that in some cities one underground service is sometimes used to supply several services brings us to the special considerations which should govern where advantage is to be taken of the last clause of Rule 17 (*d*) of the Code, which permits the inspection department having jurisdiction to waive the requirements as to the number of buildings per service when it is deemed wise to do so. Of course the National Code, if it is to be as nearly as possible of universal application, could hardly follow any other course than that which has been taken; and yet this clause just referred to recognizes the need for a slightly different procedure in some cases. These cases where exceptions or modifications are asked for almost invariably arise in cities, and they become more frequent and imperious as the city increases in size, reaching a maximum of importance, as a rule, in such cities as New York and Chicago. They are of much less importance at present in Boston. One such case is the isolated plant which finds it possible to handle not only its own building, but to serve the entire block, and which could do this with effectiveness and to the advantage of all concerned. In some instances it cannot reach other buildings than its own by using the public thoroughfares without either having to pay costs to the municipality so large as to kill the undertaking or else encountering the opposition, perhaps, of public-service corporations exerted through charter rights or sometimes through

various underground methods of obstruction. It is also true that the public-service company itself sometimes finds it desirable to run services to more than one building from a single service. Other cases will doubtless occur to all.

It appears, then, that whether it is desirable to employ one underground service to supply several buildings in the manner suggested in the question will depend markedly upon local conditions; not only upon the matters of rights in the highways, municipal building and other ordinances, and similar considerations, but also upon the character of the soil as concerns the amount of chlorine present, and its holding power for sewer gas and other inflammable or poisonous gases which may enter and find their way from one building to another, thus causing trouble and giving rise to an opportunity for peculiar questions of legal liability for damages, etc.

Finally there is the possibility of fire being caused by hot gases developed by overheated rubber insulation. These may be produced in sufficient quantities to cause a gas pressure in the conduit great enough to drive the gases some distance and into the open air through some vent or other. The gases may be hot enough to flash into a flame where they escape, or it may happen that they will be ignited by a flame from some other source. While some engineers consider the probability of such an occurrence rather remote, others think such an accident quite liable to happen. It is certain that there have been actual cases of this sort. There are good reasons for believing, however, that this hazard is subject to influences which vary in degree in different localities.

In my own territory the question of this kind of service connections has not arisen, and, judging from the present rate of increase in the population, it never will—at least, not while I am on the job. But in the larger cities I think the matter will become of more and more importance and will finally have to be met as it is now met in Chicago or as in New York. The New York electrical code is proceeding along the right lines, it seems to me, in considering that placing a conduit circuit under two inches of brick or concrete is equivalent, so far as safety is concerned, to placing it outside of the building. I am not sure, however, that this is enough and should not be surprised if at some time or other an arc should be started within a conduit with a sufficiently emphatic backing to cause fusing of the conduit, cracking or upheaving of the concrete and the final emergence of hot gases either with explosive violence or with a long, torch-like flame. I can imagine cases, in fact, where I should want the concrete to have a considerably unusual strength.

# Among the Supply Men

## WILL IT PASS THE UNDERWRITERS?

By Frank H. Stewart.

This is the question of all questions that the man with the house or factory to be wired asks the electrical contractor. The contractor asks the same question of the jobber and the jobber makes the same inquiry of the manufacturer.

The Board of Fire Underwriters thus becomes a great factor in the manufacture, sale and installation of electrical supplies. If an article has not received their approval it is unwise from a business standpoint to fool with it, regardless of whether it is the best or poorest thing of its character in the world.

I feel that the various fire-underwriters' associations are in the same class with public-utility commissions, and it would be a sorry day for the public if they should cease their work, but there is in the minds of the public a very general idea that everything of the same group bearing the Underwriters' inspection tags is of the same quality, whereas, every one in the electrical business knows, or at least should know, that this is not a fact.

The remark, "Well, if it passes the Underwriters, what do I care," has been heard all over this country thousands of times. This throws an awful responsibility on the Underwriters and has a tendency to keep price and quality down to an equality with the cheapest and lowest grade article they will approve. Rubber-covered wire is a very good example of what I have in mind.

My idea of overcoming the trouble to a great extent is to awaken the manufacturer to his opportunities so that he will advertise his materials in conformity with the Underwriters' or some other equally unbiased tests. If he makes a device that excels the requirements of the Underwriters, he should take advantage of that fact or else the Underwriters should have special ratings for appliances that are far ahead of their test requirements.

The Underwriters have done wonders for the electrical business, and without their suggestions and co-operation, electricity would not be so generally used as it is today, but I believe that they are unconsciously handicapping desire for improvement, because the poorest thing that will pass their inspection, if it happens to be the cheapest thing of its class to make, immediately has an unfair advantage over a more durable or safer article that costs more to make. In other words, the best and poorest articles are sold side by side, with nothing to indicate that they are of different quality. The man who knows nothing about quality whatever from past experience is confused and is too frequently tempted to buy the cheapest, and in this way discouragement rather than encouragement is put upon a meritorious article.

The trouble, as I see it, is that no information regarding quality tests leaks out to the man who eventually pays for electrical work and appliances—I mean, the consumer—and every electrical contractor knows how hard it is, when in competition, to bid on the material he knows to be the best and run a good chance of getting the job because he has bid on the best. The make of goods or the quality is rarely specified on the ordinary job, and the architect and owner place all of their confidence in the Underwriters' certificates, which as a rule must be delivered before the final payment is made.

When a man buys an article made of gold he knows by the marking whether it is ten or eighteen-carat, and I think that the manufacturer who will not hand out information regarding the breakdown tests of his product is hiding his

light under a tin can that will soon be badly dented or overturned.

The standard of requirement should be no secret to any one interested, and the record of test performance should be advertised, and then one could knowingly get just what he prefers under the circumstances.

## PURCHASING SYSTEM.

### By George W. Craighead.

In any business the first important item is that of purchasing. To assist in this you should have an up-to-date list of catalogues, etc., properly indexed and filed. When any article is to be purchased there should always be some form of order written for same. If this order should be given to a salesman or over the phone same should be confirmed with a written order. These forms vary a great deal, but in substance they are the same. A good form may be made as below.

No. 1 headed "original," with heading showing purchaser's name and location and space for order number. Under this space should be instructions to "mark invoice and each package with this number," date line and lines indicating route over which shipment

Purchasing Department

Craighead Plumbing and Electric Co.

Order No. 495. Richmond, Ind. Dec. 9, 1911.

To ... Ship via ... When Rush.

To ... Quantity ... Price

600 No. 188,704 receptacles List each .55

(Sample order for Electric Review & Western Electric)

Less 30%

Please acknowledge receipt of this order and advise date you will make shipment.

CRAIGHEAD PLUMBING & ELECTRIC CO.

Send bill(s) receipt showing weight and through rate with each invoice.

Order Form.

should be made and also time for making shipment. Following is space for quantity, description, price of articles to be purchased, quantity column being on the left and price column on the right side of the sheet.

The second sheet, headed "office copy," is an exact duplicate of the original, and is made with a full sheet of carbon paper. The third sheet, headed "receiving clerk's copy," has the same heading as Nos. 1 and 2, but the quantity column does not show quantity purchased, and the price column is taken up in three divisions headed "check shipments in which items were received," and is divided into sections first, second and third. Both these columns are purposely left blank by cutting the carbon paper in such a manner so as to show description only. This arrangement makes it possible for the receiving clerk to know from whom goods are ordered, how they are to be shipped and a description of the article, but he does not know the quantity nor the price and consequently when the shipment is received he is obliged

Purchasing Department
Craighead Plumbing & Electric Co.

Richmond, Ind., Dec. 9, 1911.

Our Order 495 Dated 12-9-11 Your N

Dear Sirs:—
Please advise by return mail when we may expect shipment of the above. Immediate shipment is necessary.
Remarks:

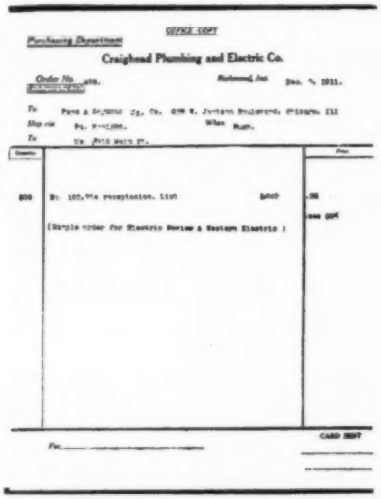
(Sample card for Electric Review & Western Electric)

Yours truly,
Craighead Plumbing & Electric Co.

Postal-Card Inquiry.

to count or weigh the articles and insert the amount received in the quantity column.

When the receiving clerk receives a shipment he checks the number of packages received from the drayman and places the corresponding order



OFFICE COPY

Purchasing Department

Craighead Plumbing and Electric Co.

Order No. 495. Richmond, Ind. Dec. 9, 1911.

To ... Ship via ... When Rush.

To ... Quantity ... Price

600 No. 188,704 receptacles List each .55

(Sample order for Electric Review & Western Electric)

CARD SENT

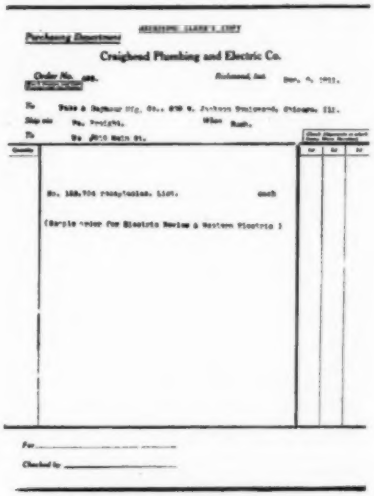
Duplicate Order Form.

number on the freight bill. Both his order copy and freight bill are then turned into the office.

The second sheet or office copy is kept on file in the office. When the original order is sent it should be acknowledged by the company to which it is sent, and they should advise when they expect to make shipment. If this acknowledgement and shiping date is received within five days, it is filed with the office copy. If it is not received within this time a regular form postal card is sent (see above sample) which is headed with the purchaser's name and address, date line, and reads

as follows: "Our order number (blank), dated (blank), your number (blank). Dear sir:—Please advise by return mail when we may expect shipment of the above. Immediate shipment is necessary. Remarks." Under remarks is left as much space as possible on the card for any further instructions. When this card is sent a memorandum is made on the bottom of the office copy and should a reply not have been received within a reasonable length of time additional cards are sent until reply is made and shipping date given.

All correspondence pertaining to orders should be headed "subject our number (blank)" and copies of correspondence should be filed with office copy. When shipment has been received all papers pertaining to the order are put together, including bill of lading, freight bill, etc. These are then compared and checked and invoice when found correct, O. K.'d. All invoices are then gone over and each item compared with the cost book. When purchasing new articles they are then entered in the cost book. If it is an article that you have previously purchased, check the cost of same, making any necessary changes. This will



RECEIVING CLERK'S COPY

Purchasing Department

Craighead Plumbing and Electric Co.

Order No. 495. Richmond, Ind. Dec. 9, 1911.

To ... Ship via ... When Rush.

To ... Quantity ... Price

No. 188,704 receptacles. List. each

(Sample order for Electric Review & Western Electric)

For _____

Checked by _____

Receiving Clerk's Copy.

give you an accurate cost record of the goods you actually have in stock.

After this work has been compared, invoices should be entered in a bills payable ledger and paid by check and voucher in the regular way. When receipted voucher is returned same should be filed with invoice in such a manner as to be readily accessible.

When goods are returned for repair an order should be made out for this work. This would make an accurate office record, as well as giving the receiving clerk the information that he is to receive such an article. When goods are returned for a credit memo-

randum, same should be charged out as a regular account and entered in the ledger, which can be credited when credit is received.

**Supply Men and Their Interests.**

Electrical supply houses all over the country enjoyed a fine season in the sale and distribution of holiday electrical goods. Heating and cooking devices of every description, Christmas tree outfits, flash lights, small motors and more durable electrical novelties have been widely advertised in the magazines of big circulation and the public has taken hold with a firm grip upon the desirability and utility of these electrical contrivances.

W. Denny Shaler, secretary of the Doubleday-Hill Electric Company, Pittsburgh, Pa., is known not only in Pittsburgh but all over the country as one of the livest men in the supply business. Denny had a long training on the road before he settled down to a desk to tell the other fellows how to do it, and he has retained all his old acquaintances and made a host of new ones. Denny does not always stay in Pittsburgh, but travels a good deal and is a familiar figure at many of the state and national conventions. He is an enthusiastic Jovian and takes a leading part in the Pittsburgh rejuvenations, being also a "Booster." The growth of the fraternal spirit among the electrical men in Pittsburgh is in a large part due to the energetic and efficient work that Denny Shaler has done in the last two or three years.

The Central Electric Company, Chicago, Ill., one of the largest and most progressive supply houses in the country, has had a good year and reports substantial gains over 1910. This is due in no small part to the good work of T. C. Ringgold, sales manager of the company. Mr. Ringgold is without doubt one of the keenest observers of things in the business, and his business sagacity and mastery of executive detail have been tried out on many an occasion and he has not been found wanting.

John W. Porter and Max A. Berg, of the Electric Service Supplies Company, were speakers at the luncheon of the Electric Club of Chicago last week, when the farewell was given to James G. Pomeroy, who goes to Cleveland as sales manager of the Adams-Bagnall Electric Company. Mr. Pomeroy has been very intimately associated with Mr. Porter and Mr. Berg for a long time, and each of the latter paid a very feeling tribute expressing their high regard for Mr. Pomeroy and their great reget at the severing, though only as a matter of distance, the intimacy that had prevailed so long.

Thomas I. Stacey, secretary-treasurer of the Electric Appliance Company, Chicago, is an active member of the Chicago Association of Commerce and his good work in increasing the membership of the association, so far as electrical companies are concerned, has been highly commended. The Electric Appliance Company is a big organization and the men at the top are known wherever electrical supplies are used. W. W. Low, president of the company, is extremely popular, and Perry Boole has spread the fame of his house far and wide. Perry made one of the best little speeches that anyone ever heard at the Pomeroy luncheon at the Electric Club of Chicago. Then there is Bob Mitten, whom everybody likes, and F. J. Alderson, in charge of the engineering department, all of whom have established a most enviable reputation as hard workers, good fellows and men whom other men can trust.

The Manhattan Electrical Supply Company, New York, N. Y., represent probably the most diversified lines of any supply house in the country. The company has a big house in New York, a branch house in Chicago, and a factory at Hoboken, N. J. The active head of the organization is B. H. Ellis.

Stanley & Patterson, New York, N. Y., is one of the oldest supply houses in the country. This company has the handsomest office and salesrooms seen anywhere, both in its downtown and uptown houses. The counter business is enormous, and every man in the stores is trained to help the customer and get the orders out quickly. Few men in the supply field are as well known or well esteemed as George L. Patterson, head of this company.

# Legal Notes

## RESPONSIBILITY FOR INJURIES DUE TO ELECTRIC SHOCKS.

**By Maguire and Mooney.**

Lomoe was killed by coming in contact with a guy wire which received an electric current from the primary wires of the Superior Water, Light & Power Company. This company did not own the guy wire, and there was nothing in the case to show who did own it. The guy wire had sagged or in some other way had fallen across the trunk wires, and when Lomoe came in contact with the lower end of it he was killed. Various people at different times saw the contact between the two wires, as it was indicated by sparks and noise. On this basis it was held that the company had notice of this defect, and the court affirmed a judgment of $2,500—Lomoe vs. Superior Water, Light & Power Company, 132 N. W., 624.

Actual notice to the company, in these cases, need not be brought out nor shown. If there are defects in the outer system of electrical wiring the company is the first one bound to know it, and should not permit anyone to find out the defect to the latter's injury. In other words, the company must see that all wires that come in contact with their primary wires are sufficiently insulated or are kept away from actual contact. Frequent careful inspection will relieve the company ordinarily from liability.

It does not make any difference by whose wire the injury or death was caused as long as that wire received its current from a wire belonging to another company. This rule is general in all states.

Every wire carrying a current which is where any person can touch it or come into contact with it should be so insulated or fixed that no electric current will be felt by such person. Grounding devices should be so arranged and controlled that no shock can reach the general public.

Those who string wires through highways for the purpose of transmitting electricity for private gain owe to the public a duty of seeing that such are properly constructed and properly maintained. It has been held time and again that to maintain an uninsulated wire charged with electricity in any public place, in such proximity to the ground that persons passing may come

into contact therewith, constitutes negligence.

It is a duty of a company to inspect its wires and equipment to inform itself as to whether they are safe. The fact that a storm of any kind caused the wires to break, fall or sag does not affect the rule at all; in fact, if a storm has occurred, it is the company's duty to immediately fix the wires.

The noncompliance with some city ordinance may constitute a clear case of negligence if an accident occurs through the company's failure to obey such an ordinance. The ordinance of the city should be examined well along this point.

The rule as set forth above is for the protection of the public in public places. There is another rule for the protection of people on private property.

Where the owner of a house or some one of his family or some one acting for him is injured because of defective wiring or defective equipment in the house, the company is liable. This is the rule even though the company is not responsible for the interior installation. If a third person or company has installed the interior equipment and the company has connected up its service the company is responsible for accidents occurring from the defective installation. The company's liability is lessened in cities where provision is made for an electrical inspection.

This is not the rule in Iowa nor Virginia, and companies operating in those states do not have to heed this rule.

According to this rule it is necessary for the company to inspect the wiring before giving service.

The company owes no duty to trespassers, and if one is not rightfully on the premises his injury cannot give him a remedy against the company, unless the defect in the interior installation is wanton or malicious.

The gravest rule of all is the one where children are the ones injured. Whether there is a defect on a public highway or on private property makes no difference when children are the victims. Children do not realize the dangers attendant upon electricity and are just as apt to touch the shining uninsulated wire as to do any other thing.

In the case of Frantz vs. Citizens' Electric Company, 80 Alt., 1106, the electric company's high-tension wire had broken from its pole and it was then attached to a neighboring pole—a telephone pole. Frantz was an employee of the telephone company and did not know of the new arrangement. In climbing the telephone pole he came into contact with the high-tension wire and was killed. The company contended that if he had looked up as he was climbing he could have seen the high-tension wire, but it was shown that it was necessary for him to watch his feet in climbing the pole, and therefore it was impossible for him to look up. The court held there was no contributory negligence and sustained the judgment against the company. This is a close case and the only thing that in a way showed that Frantz was exercising care for his own safety was the fact that he did not look up because it was necessary for him to watch his feet. Frantz, however, had no knowledge of danger—the high-tension wire had never been there before, and Frantz's work consisted of working on insulated telephone wires. It seems self-evident, however, that if Frantz had taken the care to look up for just a short moment before he started to climb he could have seen the gleam of the high-tension wire and this would have saved his life. When the electric company put the high-tension wire over on the telephone pole, it should have painted on the lower end of the pole a short warning and this would have probably been sufficient to protect the linemen.

Lydon vs. Edison Electric Illuminating Company, 95 N. E., 936, also shows this. Deceased was trimming trees, and he had to go up into a tree to perform some difficult work. His attention was directed to a wire, the insulation of which had worn off. In descending his hand came into contact with the wire, but no one knew whether it was accidental or voluntary. When he was last seen he was below the wires, so the court came to the conclusion that he reached up and touched the wire to see if there was a current in it. Of course, if such were true, it was plain negligence.

In Ex parte Goodrich, 117 Pac., 451, the question of municipal regulations came up. The Pacific Light & Power Company was engaged in supplying electricity in the city of Los Angeles. An ordinance of the city granted it a franchise and later on the city passed another ordinance prohibiting the company from charging for lamp service or renewals. It had been the custom of the company to furnish renewals free but no burden was placed on the company by the first ordinance. The court held that the ordinance required the company to furnish electricity at certain rates but that it did not require the company to furnish lamps free of charge. They said that, along this line, gas companies might be required to put in gas plumbing and fixtures free of charge. Accordingly the court held the second ordinance was unconstitutional as it violated the principles of constitutional law—it was a confiscation of property without due process of law.

This is, in a way, different from the Illinois rule set out some time ago. However, in that rule no ordinance was involved. Where the electric company agrees to furnish service and it voluntarily furnishes transformers to its patrons to protect them in the use of the electricity, it must furnish such transformers to all its patrons and cannot discriminate, even where the company furnished the transformers when it took the contract itself for wiring.

In the case of Stephens vs. Pacific Electric Railway Company, 117 Pac., 559, Stephens operated an electric grinder. The appliance had been operating successfully but on the morning of the accident the apparatus proved to be out of order. It was thought the trouble was in a broken ground wire, but when this was repaired the machine still failed to perform proper work. The commutator was cleaned and the foreman directed Stephens to see if it would then work. When the electric current was turned on the grinder "flashed fire" and injured Stephens. There was no fuse connecting the motor and the feed wire, and the court held that on that account the company had failed to furnish safe and secure appliances.

This is a pure rule of master and servant, and those states that have an employer's liability law do not have to concern themselves about the application or reason for this rule. It is the duty of the employer to furnish safe and secure appliances, but this does not mean that he shall procure all the new safeguards on the market, or even the newest inventions, but that he shall maintain reasonably safe apparatus for his employees.

This rule is subject to some well known exceptions. The rule is modified where the servant is employed for the very purpose of making the tools or place safe. If Stephens had been hired to repair the grinder he would have had a small chance of recovery, but he was only an operator and knew practically nothing of the properties of the electric current. The case of a trouble finder for an electric company is very much to the point. The company owes no duty to an employee who is employed to go out and search for some defect, such as to discover where a leakage occurs.

### Damage for Workman.

The Court of Appeals in New York affirmed on December 13 a judgment of $8,000 against the Interocean Telephone & Telegraph Company in favor of Fred Bauer. The latter was employed by the company as lineman and by the breaking of a pole on which he was working he fell to the ground, breaking both ankles.

# Public Service Commissions

## WISCONSIN.

The Wisconsin Commission recently handed down its decision on the application of the La Crosse Gas and Electric Company for authority to increase, in certain respects, its schedule of charges for gas, electric and heating service. The increase was applied for on the grounds that the present revenues were not sufficient to pay depreciation charges and to return a reasonable interest upon the investment. The chief question in controversy at the subsequent hearings was the matter of plant valuation. The present condition and organization of the La Crosse Gas and Electric Company is due, in a large measure, to the antagonistic feeling which has long existed between the city and the company. This has twice culminated in the organization of a competing company which, in each case, was merged with the petitioner after a short period of futile competition. The inevitable result was a loss in revenue through cut rates, and the acquisition of duplicate apparatus and unprofitable customers. Regarding the question of competition the Commission states as follows: "It seems quite certain that municipalities are to some degree responsible for the increased cost of service and losses in conducting the business when they permit duplicate investment to serve an already adequately supplied public. Just how the public in such instances expects to permanently profit by such action is difficult to say. As a rule its action is believed to be due to a misapprehension as to the cost of service, the amount of profit utilities usually earn, and the rights to which they are entitled. High rates, poor service or other local circumstances have sometimes formed the grounds upon which attack or retaliation has been made by the public by permitting competition to take place, and to what extent it was justified therein, in the absence of other protective methods, depends largely upon the importance of these offenses and whether the utility was responsible for them."

The company's book value of date June 30, 1909, was $1,290,530 which was increased to $1,827,000 during the period to June 30, 1910. The total reproductive value on the former date, according to Commission appraisal, was $963,086. The present value of the physical property, according to appraisal and subsequent adjustment, is $719,740, with a reproduction cost of $921,337. In arriving at the present cost of reproduction, the Commission deducted the value of a considerable portion of the duplicate equipment, acquired through consolidation, as property not used or useful. The cost of pavement was limited to the actual cost incurred in cutting through it. The company vigorously contended that the total reproductive cost should either be included in the plant valuation or else included in the total value of depreciable property. This view was not taken by the Commission for the reason that a utility is not entitled to earn interest upon anticipated expenditures. No amount was allowed for going value because, from the meager information obtainable concerning the company's past activities, the Commission was of the opinion that the earnings had been sufficiently high during past years, with the possible exception of the time when keen competition existed, to reimburse it for the earlier losses.

From an examination of all facts in the case the Commission was of the opinion that the company was entitled to earn interest upon a valuation substantially equal to the present cost of reproduction, and that in order to enjoy a reasonable rate of return upon that portion devoted to electric lighting, an increase in net revenues was necessary. To accomplish this the minimum bill was ordered increased from 75 cents to $1.00, and the percentage of active connected business load was increased from 33 to 38 per cent. No change was made in the rates for residence lighting, and no change was ordered in the present rates for electric power, gas and hot-water heating, but the Commission recommended that the respective schedules be altered in order to conform more closely with the actual cost of service.

### Kaukauna Purchases Plant.

The Commission in a former order has fixed the sum of $50,000 as the price to be paid by the City of Kaukauna for the purchase of the property of the Kaukauna Gas, Electric Light and Power Company. This is the first case of importance where a municipality has exercised the option of purchase, which the law allows, where a utility operates under an indeterminate permit. The controversy over the question of adequate service, which has existed between the city and the company for many years, was primarily responsible for the city's action. On a previous occasion the company was in trouble with the Commission for not complying with the standards of service as laid down by the Commission. The investigation made at that time showed that the plant was, in many respects, inadequate to properly take care of service demands. Several plans were proposed by the company for putting the property into condition to render efficient service but none were completely carried out. A considerable portion of the equipment, which should have been replaced, according to these tentative plans, was deducted by the Commission in arriving at the revised present valuation of $44,992. By using the method which the Commission has employed in its former decisions for showing the existence of going value, the company endeavored to prove that the present value of the property was at least $79,000. It developed, however, upon investigation, that two years after the present company took hold of the property the earnings were sufficient to more than pay an 8 per cent interest charge after allowing 5.72 per cent for depreciation, but that thereafter, on account of mismanagement, the net earnings materially decreased. The small net revenues were not due to the cost of building up the business but to inefficient management, and were not therefore considered as evidence of going value. After considering the somewhat speculative value of the company's present water-power lease, the loss of earning power due to mismanagement and all the other elements involved, the Commission fixed the compensation at $50,000, this sum to be paid within sixty days.

### Milwaukee Securities Approved.

The Commission has granted authority to the Milwaukee Electric Railway & Light Company to issue $4,000,000 par value of five-per-cent general and refunding mortgage bonds for the purpose of paying an outstanding indebtedness incurred by reason of additions and extensions made to its property during the years

1910 and 1911, and for making future extensions and additions. The issue is to be secured by a mortgage issued to the Bankers' Trust Company, of New York, as trustee. The Commission further ordered that the certificate authorizing the issue of $2,000,000 of refunding and extension mortgage bonds, dated September 28, 1911, be amended so as to enable the company to sell or pledge the bonds authorized under this certificate.

## NEW YORK.

That the building of railroads by bond issue alone is frowned upon by the Public Service Commission, Second District, New York, is evidenced in the opinion just written authorizing the issuance of securities for the construction of the Hudson River and Eastern Traction Company's trolley line from Ossining to White Plains in Westchester County, a distance of 16 miles.

In the case just decided, the Commission was confronted by the unequivocal and unmodified statement of those representing the applicant that the construction of its proposed road is wholly dependent upon the authorization to issue bonds for the amounts needed; that stock will not be subscribed for the same, and therefore if authority to issue the bonds is denied the enterprise must fail. The applicant insisted upon issuing bonds for the entire amount.

### Bonds Authorized.

The Commission, in authorizing this company to build its railroad upon the proceeds of bonds alone, states that it faces the alternative of preventing the construction of a railroad from Ossining to White Plains, or permitting it to build upon bonds, although it cannot prove by affirmative evidence that the returns will not be as great as those claimed by the company.

The Commission reviews its published opinions to how capitalization should be divided between stock and bonds; that bonds should not be permitted beyond an amount on which the enterprise will be practically certain to be able to pay interest. The Commission asserts that it still adheres to the opinion thus expressed, without the slightest abatement in any respect; except that decisions of the courts since the Commission took its position have placed in more than doubt the power of the Commission to determine whether capitalization should be by stock or bonds alone or a division of the same between the two, against the express determination of the corporation itself. If the Commission clearly and unequivocally possesses the power which it then supposed it had, it would exercise it in this and every other case in accordance with the principles which it has enunciated.

The company asked authority to issue $850,000 bonds for three purposes: to pay for the completion, construction and equipment of its railroad, $621,000; to pay for the cost of the branch on Spring Street in the village of Ossining, $25,000; to pay a deficit of $24,963.60 which has resulted from the operation of the portion of the road built in the village of Ossining during the past three years, and also to pay a judgment of $8,000 with costs and interest. The total of these items is $680,000, being 80 per cent of $850,000, the amount of bonds asked for.

The Commission allowed a bond issue of $806,000. The bonds, if sold at 80, will produce $644,371, which, from the Commission's investigation, is a sufficient amount to take care of the proper capital purposes of the company. Items amounting to $15,000 for working capital the Commission deems unnecessary and has disapproved, believing that the estimates for other matters are large enough to provide for all of these matters and will leave a surplus sufficient to furnish needed working capital.

### Overvaluation.

Attention is called to the fact that existing capitalization of the Company is stock, $84,000, bonds, $75,000. An examination by the Commission disclosed the fact that stock to the amount of $9,000 appears to have been issued for cash, as required by the Railroad Law upon the incorporation of the company. The remaining $75,000 in stock, together with bonds to the amount of $75,000, were issued for the construction of the main line of the road from the village of Ossining to Camp Woods, a distance of 1.8 miles. The company reports the cost of this portion of line to be $95,766 a mile, whereas the Spring street extension, a length of 0.89 mile, is shown to have been built at the rate of $29,000 a mile. The Commission comments upon this state of facts that it is reasonably apparent that stock to the amount of $75,000 was practically issued as a bonus with the bonds, the proceeds of which built the line now in existence.

The Commission further says "that the responsibility of deciding the question of capitalizing this project should be placed upon the board of directors under all the circumstances of this case, and should not be assumed by the Commission; and it must definitely disavow in this case any responsibility to the purchasers of bonds as to the earning power of the road or the probability, or possibility, even, of the road paying fixed charges. The directors must assume the sole responsibility of putting out upon the world these securities, and of inducing people who have not studied the subject to invest their money. The Commission cannot undertake, in this case, to act as guardian to bond purchasers, and the authorization of these bonds by the Commission must not be understood by anyone that the Commission considers them a safe and prudent investment." The opinion finally states that a bare majority of the Commission concurred in this disposition of the case, two Commissioners believing that the application should be granted only with a reasonable proportion of stock, leaving the court to decide whether such course is within the Commission's power.

## INDIANA.

The order by the Railroad Commission, made last spring, requiring locomotives to be equipped with electric headlights of not less than 1,500 candlepower, has been declared void by Master-in-Chancery Butler, upon the grounds that the order is uncertain and indefinite. He finds that it is within the power of the Railroad Commission to regulate the headlight question, provided in doing so it is certain and definite and within constitutional and statutory limitations. The opinion states that the Commission may make a new order more definite and certain as to the size and character of the reflectors and indicate the point at which the measurement of the candlepower should be made. The law of Indiana giving the Commission the power to investigate the condition and efficiency of headlights in use on the locomotives of the railroads of the state, and to make an order requiring the use of particular types of headlight is upheld. The Indiana Commissioners have taken an appeal to Judge Anderson of the Federal Court, asking him not to approve the master's finding, believing their order is sufficiently definite.

## CALIFORNIA.

As a result of the message of Mayor Alexander, of Los Angeles, to the City Council, suggesting that a salary be paid to the incumbent of office of the president of the local Board of Public Utilities, the Finance Committee of the City Council reports that it cannot approve of such recommendation for compensation, and believes that a careful investigation should be made with the view of the advisability of placing the regulation of the utilities of the city under the control of the State Railroad Commission, whose jurisdiction is extended over such domain by recent legislative action taken in the matter.

# American Physical Society.

## Joint Meeting With Section B of the American Association for the Advancement of Science in Washington, D. C, December 27 to 30, 1911.

The meeting last week in Washington, D. C., of the American Association for the Advancement of Science and affiliated societies was one of the most successful ever held by that organization. The total attendance exceeded 2,000. The various sections held joint meetings with the affiliated societies in different parts of the city. Section D, Mechanical Science and Engineering, met at the Georgetown Law School Building. Its program was made up largely of papers on aerial navigation and on road building, there being none on electrical engineering. Section B met in conjunction with the American Physical Society at the Bureau of Standards.

### General Session.

There was only one general meeting of the entire Association and this was held in the new building of the National Museum on the evening of December 27. Addresses were made by President Taft, by Charles D. Walcott, secretary of the Smithsonian Institution, and by A. A. Michelson, retiring president of the American Association. The subject of Professor Michelson's address was, "Recent Progress in Spectroscopic Methods." Edward C. Pickering, professor of astronomy in Harvard University was chosen president of the Association for the ensuing year. A. G. Webster, of Clark University was chosen vice-president for Section B, and J. A. Holmes, director of the Bureau of Mines, vice-president for Section D. The secretary of Section B is W. J. Humphreys of the Weather Bureau, Washington, D. C. The secretary of Section D is G. W. Bissell, of the Michigan Agricultural College, East Lansing, Mich. The next meeting will be held in Cleveland, O., in Christmas week, 1912.

On the evening of December 29, a subscription dinner was given by the Philosophical Society of Washington, in honor of Section B and of the American Physical Society. E. B. Rosa acted as toastmaster and called upon A. A. Michelson, of the University of Chicago; W. F. Magie, president of the American Physical Society; R. A. Millikan, chairman of Section B; H. A. Wilson, of McGill University; S. W. Stratton, director of Bureau of Standards; L. A. Bauer, of Carnegie Institution; A. G. Webster, of Clark University; and E. L. Nichols, of Cornell University.

At the joint sessions of Section B and the American Physical Society, there were presented 56 papers on a variety of physical topics. These were in addition to the addresses made on Thursday, the sessions on that day being devoted to a symposium on "The Aether," and to special addresses of general interest. The above symposium was participated in by A. A. Michelson, Edward W. Morley, A. G. Webster, D. F. Comstock, W. S. Franklin, and like the address of President W. F. Magie, was devoted largely to a discussion of the new theory of "Relativity," which endeavors to reconcile the conflicting experiments of optics, and to explain the failure of the celebrated experiment of Michelson and Morley to detect any drift of the aether through matter, by assuming that the length of a body varies with its velocity when the latter is excessive. The address of E. B. Rosa, retiring chairman of Section B, was on "The Work of the Electrical Division of the Bureau of Standards." It was followed by two others; one, by H. A. Wilson on "Structure of the Atom;" the other by S. W. Stratton on "Physical Work at the Bureau of Standards."

### Scientific Papers.

In the regular program of papers there was one by S. R. Williams, in which the author aimed to find a relation between magnetostriction and magnetic permeability. Both rise to a maximum and then decrease in fields of increasing strength, but the maximum elongation occurs in a stronger field than the maximum permeability.

This paper was followed by one by C. W. Burrows, in which it was shown that the magnetic properties of steel were affected by flaws and mechanical strains, so that a magnetic test might easily be used to indicate where strains had been produced. He had been unable to find any bar as long as eight feet in which there was not variation exceeding five per cent. Stamping numbers upon a bar had increased its magnetic reluctance 10 or 20 per cent. When a rod is bent, one portion of it has the permeability increased and another portion decreased, the increase occurring in the portion subjected to tension, and the decrease where compression had occurred.

A. A. Somerville told of experiments conducted by himself and O. E. Buckley on the electrical properties of mixtures of clay, feldspar and mica. The resistance of a short cylinder is extremely high at ordinary temperatures, but decreases to 50,000 ohms at 500 degrees and to 15,000 ohms at 1,000 degrees. The material was found to be polarized after the application of a direct current, the electromotive force of polarization depending upon the time and the temperature. Various curves were shown depicting the rate of decay of the polarization under different circumstances. Lead wires of both nickel and nichrome had been used, the decay being faster with the latter. The polarization electromotive force almost disappears in an hour. It increases with the applied electromotive force, but not so rapidly, and also with the time of application. The polarization decreases with increasing temperature in almost exact proportion, falling from two volts to one volt at about 1,150 degrees. The rate of discharge at the latter temperature is about double the rate at 750 degrees.

### Crystal Rectifier.

R. H. Goddard presented "A Study of Crystal Rectifiers," in which he showed that the amount of rectification depended upon the presence of oxygen and also upon the purity of the material. Thus with pure tellurium or silicon there is no rectification in either vacuum or inert gas, but rectification becomes apparent in the presence of oxygen. In a vacuum, copper filings follow Ohm's law, showing the resistance to be constant, but upon admitting air a coherer effect is observed. With galena, however, the results are very nearly the same whether the material is in air or in a vacuum. The author called attention to the possibilities of both surface and body rectification.

W. W. Strong described some experiments which had been carried out at the University of Pittsburgh to show the effect of electrical discharge upon solids and liquids suspended in the air. Both mists and carbon can be so precipated, but considerable trouble is found in the case of particles of carbon and of tar. Successful experiments in California were referred to, where solid matter and noxious fumes had been precipitated, although at considerable expense.

In a paper on "The Specific Heat of Wood," Mr. Draper showed that erroneous values for this constant are given in many of the handbooks. He found that with definite conditions of drying, the values for different species of wood were very nearly the same, the mean value between zero and 100 degrees being 0.327. There is a large temperature coefficient, however, so that the value at any particular temperature within these limits may be given by $0.266+0.00116t$.

### Electrical Constants of Crystals.

H. L. Curtis, of the Bureau of Standards, gave some results of measurements upon "The Dielectric Constant, Specific Resistance and Electrostatic Absorption of Crystals." The values which were found for the dielectric constant and for the resistivity for a number of crystals are shown in Table 1. Fluorite was

found to be free from absorption. Except for this mineral, mica showed the smallest absorption of any of the materials measured and while the value was very small it was appreciable. Spodumene, one of the materials having high dielectric constant, had an absorption 100 times as great as mica. It will be observed that mica had the highest resistivity of any of the materials measured, while rutile, which had the highest dielectric constant, had the lowest resistivity.

TABLE I.

| Crystal | Dielectric constant | Percent absorption in one sec. | Resistivity in millions of megohm-centimeters |
|---|---|---|---|
| Mica | 6.8 | 0.30 | 80,000. |
| Fluorite | 6.9 | 0. | 3,000. |
| Calcite | 8.3 | 3.7 | 1,600. |
| Quartz | 4.9 | 13. | 69. |
| Selenite | 4.8 | 6.5 | 1,400. |
| Green Beryl | 5.6 | 4.4 | 200. |
| White Beryl I. | 7.4 | 25. | 17. |
| White Beryl II. | 9.3 | 9.2 | 160. |
| Cryolite | 6.2 | 10. | 200. |
| Apatite | 7.8 | 13. | 1,200. |
| Barite | 9.0 | 24. | 6. |
| Spodumene | 17.6 | 27. | 6. |
| Monocline | 5.8 | 32. | 23. |
| Feldspar | 5.7 | 29. | 24. |
| Celestite | 6.3 | 37. | 380. |
| Talc | 5.8 | 36. | 50. |
| Rutile | 31. | | 0.09 |

A paper was presented by A. G. Worthing, of the National Electric Lamp Association, describing how the thermal conductivity of tungsten, tantalum and carbon and the Thomson effect in these materials had been determined by observations upon lamp filaments. A direct determination is made of the amount of energy radiated from different portions of a lamp filament, and it is found that this quantity falls off considerably near the leading-in wires, the conduction of heat by which causes a reduction of temperature near the ends of the filament. It is found that the variation in temperature near the end of the filament depends upon whether the current is entering or leaving at this point. This is evidence of the Thomson effect, which is the name given to the phenomenon of absorption or generation of heat when an electric current flows through a conductor whose temperature is not uniform. Whether heat is absorbed or generated depends upon whether the flow of electricity is in the direction of increasing or decreasing temperature, and this effect is entirely independent of the heat generated in virtue of the resistance of the conductor. By plotting the values for the ends of a filament through which current is passing, Dr. Worthing has found it possible to determine the value of the Thomson coefficient in the various substances used for lamp filaments. Knowing the temperature of the various points of the filament and its cross-section, it is also possible to compute the value of the thermal conductivity.

Anthony Zeleny, of the University of Minnesota, described some experiments showing "The Effect of Temperature on the Absorbed Charge in Electric Condensers." He found that the temperature coefficient of the absorbed charge was very large and that this was the principal factor affecting the temperature coefficient of a condenser. His experiments show a very much larger change for temperatures above zero centigrade than below, which leads him to believe that the effect is principally due to moisture and that this may possibly be the cause of the entire absorbed charge. In discussing this paper, Edward Weston suggested that this explanation probably applies only to waxes.

In a paper entitled "The Influence of Neighboring Conductors upon a Klemencic Receiver of Electric Waves," A. D. Cole, of Ohio State University, described a number of interesting experiments showing the variation in the intensity of the received waves when conductors of different shapes were placed at various positions in the path of the waves.

**New Curve-Drawing Instrument.**

"A New Type of Curve-Drawing Instrument and Controller Mechanism" was the title of a paper by Morris E. Leeds of Philadelphia. Mr. Leeds exhibited an instrument designed to be used in connection with a Wheatstone bridge, potentiometer, or similar mechanism where motor-operated apparatus could be brought to the position for a balance whenever the needle of an indicating instrument indicated that the balance had been thrown out. Ingenious mechanism had been invented to obtain motion proportional to the deflection, and this was done without requiring any current to pass through the pointer of the instrument, which could be made very light and free from any trouble due to sticking to contacts. The instrument could be arranged with various sensibilities and so that the steps could be made large or small, the shift of the registering pen at definite intervals being so controlled as to show the exact lack of balance in the electrical circuit. This apparatus can be applied to making records for almost any kind of phenomena. In the discussion, Edward Weston pointed out that when iridium contacts were used there was no trouble from sticking, and consequently in his recording instruments he had made use of a relay for doing the actual work, while current through the pointer controlled the relay.

**The Silver Voltameter.**

Two papers by E. B. Rosa and G. W. Vinal, of the Bureau of Standards, described recent work in that laboratory with the silver voltameter. Dr. Rosa showed the difficulties which had arisen from the use of filter paper in the voltameter and how necessary it was to have the materials absolutely pure. He also discussed the errors which may arise through the use of the silver voltameter or the Weston standard cell as a second fundamental unit to be used with the mercury ohm to fix the other electrical standards. Mr. Vinal illustrated with lantern slides the various forms of apparatus used and the provisions which had been made for accurate work in this subject. Impurities of a few parts in a million in the materials used gave appreciable effects in the result.

J. S. Shearer, of Cornell University, described some experiments to determine the thermal electromotive force of a Nernst filament. While this work had not been completed, the results so far obtained indicated very high values, amounting for the temperatures ordinarily used with a filament to one volt.

**New Form of Potentiometer.**

Walter P. White, of the Carnegie Institution, described a new type of neutral double potentiometer. This was of such a form that two different values could be read successively upon the potentiometer without shifting the switches. This is frequently desirable in making comparative measurements and in using thermal couples for the measurement of temperature. He had also arranged the various contacts of the potentiometer in straight lines instead of in the usual dials, and this had been found to make the shifting easier. In addition to this, a master switch had been devised so that all of the levers controlling contacts could be simultaneously shifted from one value to another. This has greatly facilitated the work with the potentiometer and made the use of that instrument much more rapid.

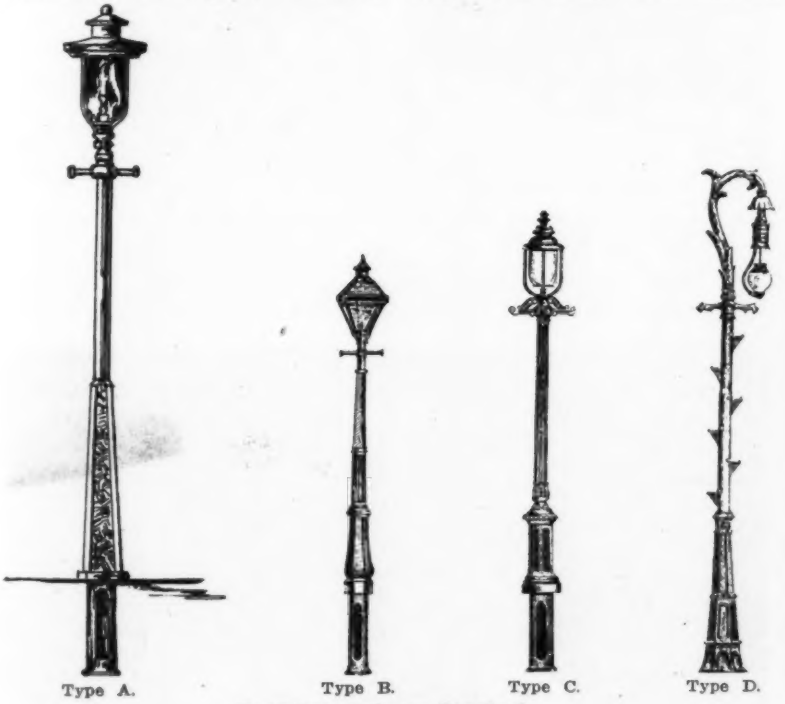
J. Johnston described a new form of mechanical vacuum pump in which no valves were used. It is known as the May-Nelson pump. Two iron disks containing ridges and grooves slide over each other with an eccentric motion so that the air is forced along these grooves, which consequently act in place of the cylinders of a piston pump. A number of these grooves are connected in series and are operated by a motor at high speed, so that the air is continuously forced out of the chamber to be evacuated. The viscosity of the air appears to prevent any considerable leakage over the sliding surfaces, so that it is found possible to obtain a vacuum as high as 0.01 millimeter of mercury in fifteen minutes. The pumping capacity at a speed of 800 revolutions per minute amounts to 300 cubic centimeters per second, and in two minutes a vessel of six liters capacity can be evacuated to a fairly good vacuum. The apparatus can also be driven by compressed air as a motor.

At a business meeting of the American Physical Society the old officers were re-elected. These consist of W. F. Magie, president; B. O. Peirce, vice-president; Ernest Merritt, secretary; Joseph S. Ames, treasurer.

## THE HISTORY OF ORNAMENTAL LAMPPOSTS.

By Manfred A. Pakas.

In considering this subject, we must begin with a definition. The History of Ornamental Lamp Posts, as we shall consider it, will be devoted mainly to the study of the evolution of the lamppposts themselves. Commonly when we speak of a lamp post, we not only mean the lamp post, but also the means of illumination used in conjunction therewith. Thus a "lamp post" may mean a gas-lighted lamp post, an arc lamp, an electric standard, etc. In this, then, we shall limit ourselves to the actual development of the "lamp post." In order to note the progress and improvement concomitant with the manufacture of the posts, we will divide their history into three periods. These periods, or epochs, are classified with special reference to the illuminant. In this arbitrary classification we will be better able to consider their degree of development. These epochs clearly mark the advance and define the evolution of modern street lighting.



Type A. Type B. Type C. Type D.

Evolution of Lamp Standards.

The first epoch is known as the oil age. The period during which oil was used as the mediums of illumination. The first lamppost had its origin in the old-fashioned hand lantern, which was used whenever it was necessary to go out at night. The lantern was adopted as a safeguard. Traffic at night in olden times was a dangerous expedition. Crime was so common that all those who ventured out not only carefully armed themselves, but also were provided with an oil lantern. In the course of natural progress, a wooden pole was subsequently fitted up with one of these hand lanterns suspended thereon. A marked decrease in lawlessness was noticed. People were reasonably safe in the lighted districts. The necessity of a street lighting system having been established, its use was the result of a natural demand.

It is commonly supposed that street lighting, in its earliest form, had its beginning in London in the year 1736. This supposition is entirely wrong. In 1697 the Common Council of the City of New York ordered the city to be lighted at night by lanterns, suspended on wooden poles that projected from every seventh house. Then came the London venture in 1736, which was the second installation.

In 1759 Benjamin Franklin constructed a rudimentary series of wooden lamp posts, which were installed in Philadelphia; this project led to the adoption of the oil-lamp posts throughout the cities of the New World.

Advance was indicated by the construction of a special type of oil lantern for service on the wooden poles. Then many improvements were made. Instead of the mere suspension of a lantern, a special receptacle was constructed at the upper end of the post. In this box, of wooden frame and glass sides, the oil lamp (much the same as our common table oil lamp) was placed. Later special poles were constructed, embodying the ornamental features. That the efficiency problem was considered is apparent, for we can all remember the tin reflector, used in conjunction with the wooden lamp posts. Thus wooden lamp posts had now achieved their perfection.

The second epoch, the era of gas-lamp posts, began early in the eighteenth century. Gas, as an illuminant, had its beginning in London. In 1808 a German scientist promulgated a plan of illumination for the City of London. His ideas were fully set forth in a treatise, widely published. Consequently his system was adopted and a series of gas lamp posts were installed in Pall Mall. Before 1850 there were almost 300 miles of London's streets lighted by gas.

Tungsten Post, Riverside Drive, New York.

The first installation of gas lamp posts in America was made in New York City. The design and structure of the early type of post is well shown in Type "A." The obvious awkwardness and rough character of the post produces what we would now consider a grotesque appearance. Yet, we must

not condemn, unwarrantedly, this post, as it served for many years with great satisfaction. The outstretched arms were made for the easy manipulation and repair of the gas burners, globes, etc. The lamp-lighter always carried a small hand ladder, the upper end of which had flanges, corresponding to these arms. In this manner he could accomplish his work with a greater degree of safety. The total height of the post was approximately twelve and one-half feet, and its weight about 200 pounds. A little over nine feet appeared above the ground.

Type "B" shows a later style, which indicates the beginning of ornamentation Type "C" represents the same general characteristics with the highest degree of ornamentation.

Early in the use of gas lamps it was found that a special post was required for the illumination of boulevards, parks and public squares. The presence of large, massive trees obliterated the light from the common gas lamps. In this manner the arc lamps were brought into general use. The difference between the ordinary lamp post and what we now call an arc lamp was really at the beginning only a difference in the height of the respective posts. Then special burners were devised, which produced much more brilliant light, with no more consumption of gas.

The early arc lamps were made with a series of steps, leading up to their tops. This is well illustrated herewith. The modern arc-lamp posts have completely eliminated these inartistic features, by the use of a windlass, which lowers the suspended arc to the level of the street.

In New York City, as in most all the important cities of the United States, gas-lamp posts are still used in great numbers. There has been almost absolute perfection realized in the manufacture of incandescent gas burners, etc., which give these posts great value in the city lighting. The use of these gas-lamp posts are now practically confined to service in the residential districts.

Thus we reach the third epoch of street lighting, the electrical, or the modern age. The rapid development of electricity, resultant in cheaper power and light, has been the direct cause of the modern lamp post. The numerous discoveries and the complete perfection of the incandescent electric bulbs have revolutionized the street lighting field. In New York City thousands of the lamp posts, formerly used with gas lights, have been wired and are now doing service as electric street standards. The illustration shows the individual tungsten post on Riverside Drive.

In the same manner the arc lamp has been improved, as is shown by the modern 12-ampere, flaming arc lamps, requiring 110 volts. The illustration of Seventh Avenue and 110th Street, New York City, shows these in use.

In the most cities it has been found that the reconstructed gas-lamp posts, though serviceable from an illuminating point of view, were clumsy and unsightly. The idea of producing a lamp post, which would be both ornamental and useful, was acknowledged to be the solution.

Numerous cities carefully studied this problem. Much time, energy and expense was directed to the production of a suitable design. The first practical results were obtained in the far West. The cities of San Francisco and Los Angeles conducted many experiments, and these cities were the pioneers in an installation of a modern ornamental system. Thus the agitation having its leader, all the progressive cities became busy to keep pace with their Western competitors.

Minneapolis began to study with great seriousness, and in 1907 adopted the post which today is *in situ* throughout the largest part of her business section. Almost 1,000 posts have been installed. The design and structure of the Minneapolis post is known as the "Corinthian" standard, and is shown herewith in detail. The picture illustrating Nicollet Avenue, Minneapolis, shows clearly the stately effect accomplished by the use of this post.

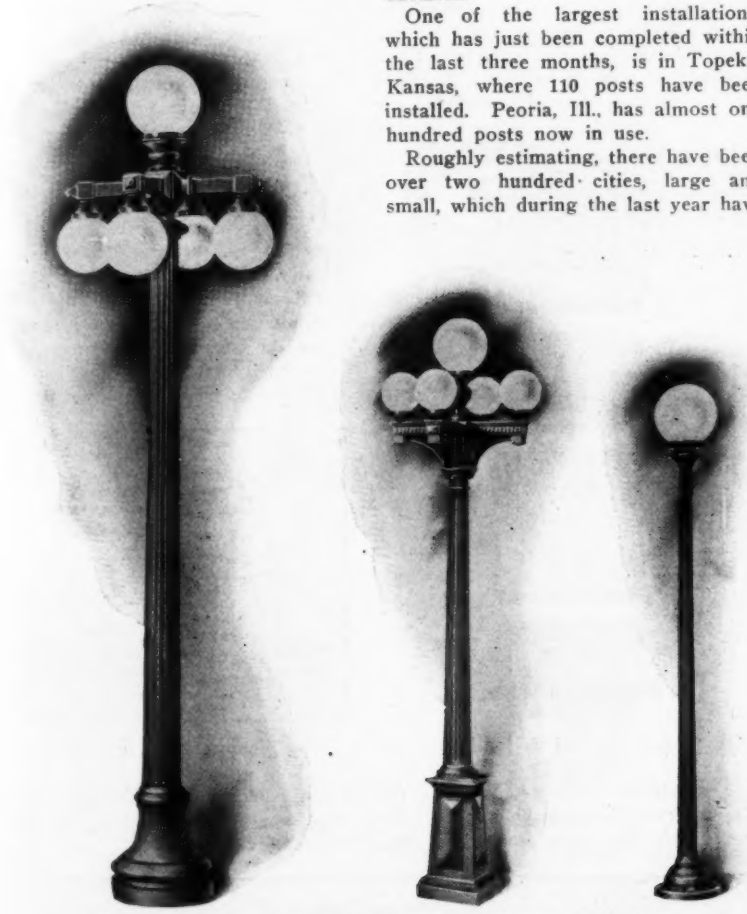
The popularity of the "Corinthian" standard has been very great. New Ulm, Virginia and Duluth immediately

Tungsten Clusters, Nicollet Avenue, Minneapolis.

Arc Lamps on Seventh Avenue, New York.

installed the same design. Milwaukee, a keen rival of Minneapolis, realized the advantages of this post and discarded a system she had in use, adopting the "Corinthian" standard. Now in Milwaukee there are about 200 of these posts installed. Atlanta, Ga., has installed almost four hundred of the "Corinthian" standards. Atlanta having begun, her rival sister cities of Savannah and Jacksonville followed the lead.

The development of lighting systems has not only been confined to this country. Canada has been acting upon her own initiative. The "Capitol" post, illustrated herewith, is installed in Calgary, Alberta, Peterborough, Winnipeg and Toronto. Toronto has more than three hundred of the "Capitol" posts installed. All the progressive cities of Canada are vitally interested in this question, and installations are being accomplished every day.



"Capitol," "Egyptian" and "Boulevard" Lamp Standards.

Other posts illustrating good modern designs worthy of mention are the "Egyptian" design, and the "Boulevard" design. The latter is particularly used for service in parks and boulevards. Its lack of ornamentation and simplicity accentuates the beauties of nature, without making itself conspicuous.

These represent modern ideas. The posts are built with considerable weight to give them permanence and stability. Cities have realized that a cheap, flimsy system of street lamps is always the most expensive. Hence, one of the principal requirements for ornamental street standards is sufficient weight. In this manner, continual repair and future up-keep costs are obviated.

One of the largest installations, which has just been completed within the last three months, is in Topeka, Kansas, where 110 posts have been installed. Peoria, Ill., has almost one hundred posts now in use.

Roughly estimating, there have been over two hundred cities, large and small, which during the last year have taken advantage of the municipal advance, accomplished by the adoption of a modern, ornamental street lighting system.

### Swedish Railway Electrification.

It is stated that the electrification and double tracking of the railway from Gothenburg to Alingsas, Sweden, will be completed by May, 1914. The distance is about twenty-nine miles. If found successful in operation, the availability of large water powers and the complete lack of coal suitable for railway purposes will likely lead to further electrification of the railways in Sweden.

### Philadelphia Electric Company Section, National Electric Light Association.

Notwithstanding the extremely busy times—always coincident with the holiday season—particularly among central-station men—the month of December found the Philadelphia Company Section of the National Electric Light Association holding its usual meetings, and all were very well attended.

The Commercial Department Branch listened to a well prepared and instructive paper on "Corporations" by C. J. Russell, who is the possessor of the first Doherty medal. At the Meter Department Branch meeting Elmer L. Kyle, of the Philadelphia Electric Company's laboratory, presented the paper entitled "The Errometer." The Errometer (error-meter) is a practical and scientific instrument which was designed and constructed in the meter department of the company. It is used for "testing meter-testers" and for determining the accuracy of the various methods of meter testing. This is the first instrument available for making determinations of this character and the results are obtained in a manner which permit of analysis. The various errors can be tabulated separately and the personal errors of meter-testers determined. The instrument is essentially of the high-speed motor-driven recording type having a multiplicity of syphon pens operated by electromagnets. Its inherent inaccuracy does not exceed 1/100 of one per cent. Mr. Kyle demonstrated the use of the Errometer and gave the results of many tests that have been conducted.

At the Accounting Department Branch meeting Geo. P. Landwehr read a paper covering the "Method of Handling Working Orders." The general section meeting was held on December 18, when A. H. Armstrong, assistant engineer, railway and traction department of the General Electric Company, gave a highly interesting talk on "The Coming of the Electric Locomotive." Invitations were extended to several railroad, locomotive and car companies, which were well represented in the audience. Mr. Armstrong made many comparisons between steam and electrically driven locomotives, particularly in the mountainous western part of the country. The speaker imparted to his audience much of his own spirit of enthusiasm and optimism, the audience became convinced that the Philadelphia slogan, "If it is not electric, it is not modern," will within comparatively few years be realized by transportation companies of all classes. The conservation of fuel, and the necessity of higher operating efficiency will surely overcome what seem to be present-day obstacles. The Philadelphia Electric Company's railway load of approximately 12,000 kilowatts made the subject particularly interesting.

# New Electrical and Mechanical Appliances

### The Franks Adjustable Shaving Mirror.

In the accompanying illustration is shown the latest device placed on the market by the Franks Manufacturing Company, of Rock Island, Ill. This adjustable mirror will be found very useful by those men who have had difficulty in obtaining a proper light for the purpose of shaving. The Franks mirror is

Adjustable Shaving Mirror.

a practical combination of an adjustable fixture, mirror and shade. The shade contains a six-candlepower lamp, either frosted or plain, and can be placed at any desired point on the circular rim of the mirror. The shade can be tilted so that the light falls either full upon the face or down upon the mirror. The shade makes a complete revolution of the circumference of the mirror and requires no manipulation of screws to place it in a desired position. It is furnished with a silk cord nine feet long, and the device can easily be packed away in a traveler's suit-case.

### White Ants Destroy Electrical Cables in Australia.

The prolific white ants of Australia have ruined a number of telephone and electric power cables in Adelaide and Sydney. The lead sheathing and insulation were completely honeycombed and rendered worthless.

### New Appleton Switch Unilets.

The Appleton Electric Company, of Chicago, has recently placed on the market a new line of switch unilets which differ materially from other makes of devices intended for the same purpose. These unilets, four types of which are illustrated in the accompanying illustrations, are made of stamped steel and are adapted

Appleton Switch Unilets.

for push-button and rotary switches. The lugs are made from machinery steel. The covers are also made from sheet steel, with rounded corners. The unilets can be supplied in enamel or sherardized finish, are neat in appearance and light in weight. They are made in two styles, and for single and double switches.

### Electrically Heated Samovar.

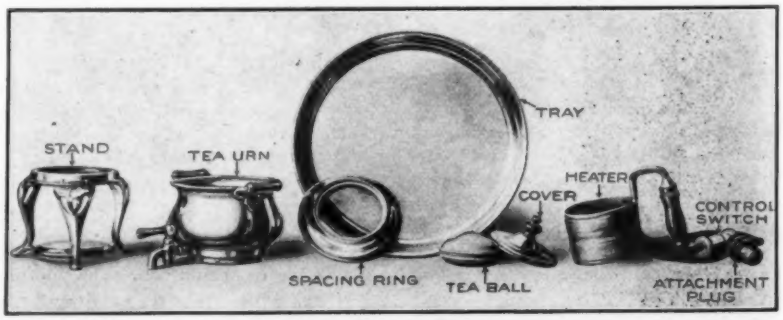
It is conceded by all drinkers of tea, that it is best prepared in a samovar, which is to the preparation of tea what the percolator is to the preparation of coffee. The word samovar is of Russian origin and designates the metal urn used in Russia for making tea, being filled with water which is heated by charcoal placed in a pipe with chimney attached, which passes through the urn.

It was but following the natural trend of the times to substitute an electric immersion-type heater for the charcoal and chimney, and the result is the electrically heated samovar.

In addition to making the best quality of tea, the samovar also possesses an additional advantage in that it is possible by its use to make the tea on the table

Westinghouse Samovar.

—just where it is needed, and the tea therefore can be served at the desired temperature.




Parts of Westinghouse Samovar.

The stand, tea urn, spacing ring, tray and cover are all formed from heavy sheet copper. The tea-ball, which opens to receive the tea and which hangs from the lowering and raising chain, is of per-

forated and tinned sheet copper. The tea-urn can be readily removed from the stand for cleaning, as it is attached thereto with a three-point bayonet joint.

The heater of the Westinghouse cylindrical immersion type is supplied. Inasmuch as the active portion of this heater is wholly submerged in the liquid in the tea-urn, all of the heat developed in the heater passes into the liquid. It is due to this feature that the device is exceptionally efficient and economical. The heating element is hermetically sealed within the copper jacket of the heater and is in intimate contact with, but insulated from, the walls thereof. The construction effectively protects against oxidization of the heating element. The heater can be used for heating liquids in any vessel that will contain it and is sold separately. A silk-covered cord, a control switch and a separable attachment plug are furnished as a regular part of each heater.

One heat only has been arranged for in the tea samovar. This will raise water in the urn rapidly to the boiling temperature, at which tea should be made and the circuit can then be disconnected.

A single-pole, telescopic switch that is always cool is inserted in the cord, conveniently close to the samovar, by which the circuit may be readily opened or closed.

The metal parts may be finished in either nickel or polished copper, while the handles have a rich ebony finish.

## A New Line of "National" Sherardized Fittings."

The National Metal Molding Company, 1014 Fulton Building, Pittsburgh, has announced a complete new line of "National" sherardized knockdown steel panel cabinets, switch and outlet boxes, cable holders and pipe clamps, locknuts and bushings. The full line is described and illustrated in catalog No. 10, a feature of this catalog being a special table giving the corresponding catalog numbers of all other makes of similar fittings.

The accompanying illustrations will give some idea of the range of this line, although it is possible in the space available to illustrate and describe only a few of the typical fittings.

No. 2,000 is a three-inch rigid conduit octagon box, with five knockouts. No. 2001 is a three-inch armored conductor and flexible steel conduit octagon box. This is equipped with four twistouts and one knockout for rigid conduit. Nos. 2000-E, 2000-G, 2000-J and 2000-P are respectively open cover, closed cover, closed cover for use with three-eights inch pipe, and tap for bushing, and cover for use with rotary snap-type switch.

No. 2060 is a one-half-inch outlet switch, outlet and junction box and No. 2060-A, B, C, E and F are respectively, open cover with gas pipe flange. cover with gas pipe flange for use with canopy cover, closed cover with gas pipe flange, and open cover for use with canopy cover.

No. 2110 and 2150 are, respectively, single and double cable holders for use with flexible steel conduit and armored conductors. These cable holders make unnecessary lock units and bushings.

No. 2026 is a compact double-gang switch box installed. This saves labor in installation, eliminates lock nuts, affords a quick assembly and is equipped with the non-detachable cable holder which will not work loose with the vibration of the building. If the switch boxes are found to project out of the finished plaster line they can be brought flush by the simple adjustment of four inside corner screws.

No. 2081 is the new two-gang sectional switchbox for use with non-metallic flexible conduit. This can be built up to any number of gangs by the use of the No. 2082 spacer.

No. 2251 is a five-eighth inch stamped steel hollow center fixture stud with stove bolts. The National standardized bushing is also illustrated herewith.

The complete line affords a fitting for every construction requirement and the entire line is sherardized, which insures against rust, provides a surface readily taking paint or calcimine, and effects an intimate and stable electrical contact.

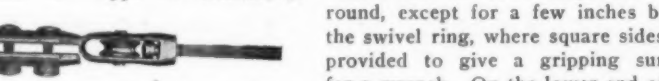
A New Line of "National" Sherardized Fittings.

### An Adjustable Anchor Rod.

In the "Adjustarod," recently placed on the market by the Crouse-Hinds Company, Syracuse, N. Y., a long step seems to have been taken in simplifying and facilitating the installation of "dead-man" anchors. The new invention is a union of all metal parts that belong to an anchor of this character, and also has turnbuckle properties designed to permit regulation of wire tension.

Type "A" Adjustarod.

The Adjustarod is made in two types —"A" and "B." Type "A" consists of clamp, pulley, swivel, rod, washer and base-nut. Type "B" has an eye, to receive the guy wire; a swivel, rod, washer and basenut.



Type "B" Adjustarod.

Each type, complete, is purchased as a unit and handled as such up to the actual work of installing. Thus, buying is simplified and there is no danger of any part being found missing at the last moment.

Type "A" Adjustarod Head.

Type "B" Adjustarod Head.

Lower Section of Adjustarod.

To start at the top of type "A" and read it downward, the clamp is of malleable iron, cast in two parts, the inner surface of each being grooved to receive the guy wire. Three seven-sixteenth-inch wrought-iron bolts, with heavy square heads and nuts, bind the two parts of the clamp against the guy wire, beyond the possibility of slipping. One section of the clamp is countersunk in squares on its outer surface, to fit the outline of the bolt heads. This arrangement holds the bolts immovable as the nuts are tightened.

Type "A" Adjustarod Head, with Guy Wire Clamped in.

Below the clamp is the pulley, the housing of which is cast with one piece of the clamp. The sheave, or pulley wheel, is a gray iron casting, and is grooved to take guy wire up to the largest standard size. Cold rolled steel is used for the sheave pin, both ends of which are upset after mounting, thus holding the sheave permanently in position. The lower end of the pulley housing constitutes the swivel ring. Through this ring projects the upper end of the rod, topped by a substantial upset head.

The rod is of wrought-iron and round, except for a few inches below the swivel ring, where square sides are provided to give a gripping surface for a wrench. On the lower end of the rod are twelve inches of threading to receive a heavy base-nut.

A large washer, of No. 10 gauge sheet steel, slips on the rod immediately above the base-nut. This washer has bent-up corners that sink into the "dead-man." Two down-turned ears, on opposite sides of the center hole, are stamped from the washer and provide a channel into which the base-nut fits snugly. The ears slightly overlap the nut and hold it tight against the washer. Nut and washer, together with the threaded rod, make up a turnbuckle of great strength. The rod alone is five feet long, and the over-all measurement is five feet and eleven inches.

In type "B" the combined eye and swivel ring is of malleable cast-iron. All other parts are identical with those of type "A."

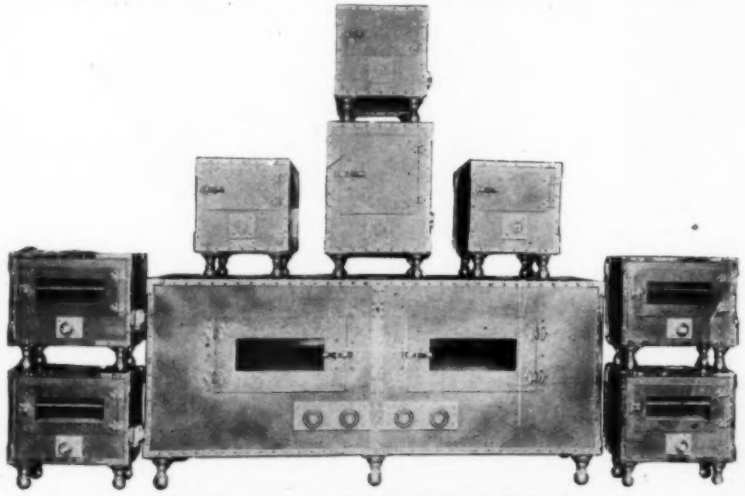
While type "B" Adjustarod seemingly is assured of much popularity because of its manifest advantages over the ordinary anchor rod, the clamp and pulley device argue strongly for even greater public favor for the type "A" form of construction. When this latter type is used, the guy wire cannot bind, but runs smoothly through the pulley. The clamp being cast with the pulley housing, is always in position to receive the wire, and hence the man's hands are free to tighten the nuts.

### An Interesting Shipment of Electric Ovens.

The accompanying illustration, made in the shipping department of the Despatch Manufacturing Company, Minneapolis, Minn., is an interesting example of the extent to which electric ovens are entering into unique commercial application. These ovens are for the Maple Leaf Milling Company, Port Colborne, Ont., for wheat and flour testing and research.

The large oven in the center is seven feet long and has a baking capacity of 24 test loaves, or 30 commercial loaves. This style oven is being used by all the largest milling and university laboratories.

The three ovens on top are the Despatch electric drying ovens which hold the temperature at 100 degrees Centigrade and are self-contained, having no controller. The two small ovens are hour samplers and are being used for drying wet samples of flour for color determinations, the process requiring about twenty minutes at a set temperature.



Electric Oven for Flour Testing and Drying.

### Alaskan Copper Production Phenomenal.

Copper mining in Alaska received an enormous impetus in 1911, the production being more than five times that of 1910.

### The Palmer Safety Limit Stop for Electric Cranes.

Those experienced in electric hoist or crane service know that with the ordinary limit switch, which merely cuts off the current from the motor, the stopping point varies considerably. If the limit is set low enough to prevent dangerous over-travel of the hoist block when the hook is light and at a high speed, a loaded hook coming up at slow speed

Palmer Safety Limit Stop for Electric Cranes.

will stop below the desired point. The drift of the motor and hook depends on the square of the hoisting speed and the load on the crane hook. Adjustment which suits one condition does not provide for all.

The new Palmer safety limit stop put on the market by the Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., will bring the hoist block to rest within two inches of any desired point regardless of whether the hook is light or heavily loaded, or whether the speed is high or low. This safety stop is not geared to the hoist nor operated by a traveling nut, but is operated by a trip rope. The motor circuit is opened and the series field connected across the armature when the hoist block reaches a predetermined point. The dynamic braking action brings the block to rest promptly. The device is inclosed in a substantial case and is made in capacities up to 25 horsepower, 110 volts, and up to 50 horsepower, 220 or 550 volts.

### Safety Car Heating & Lighting Company Business.

Plants of the Safety Car Heating & Lighting Company are operating very close to capacity at present, and officials report that the company is doing a larger business than at any time since the record year of 1909. If orders continue at present volume the company will show large earnings in 1912.

### Advance Lamp Tester.

The Advance lamp tester is a milammeter reading currents up to one ampere on either direct or alternating circuits. It is mounted with a swiveled plug at one end and a lamp socket at the other, so that it may be connected in circuit with any form of lamp. It shows not only the current consumption, but, by means of a watt-chart, shows also the number of watts corresponding to the reading of the instrument at various voltages. The meter has fine jewel bearings, hardened and polished pivots. It is finished in nickel and hard rubber and inclosed in a leatherette case for carrying.

Advance Lamp Tester.

The instrument is six inches long by 2.5 inches wide and is insulated for 250 volts. Its readings are said to be independent of frequency. It is not only a valuable instrument for salesmen and others demonstrating the relative watt consumption of various lamps, but is useful also to measure small currents for other purposes.

The accompanying illustration shows the appearance of the lamp tester. It is manufactured by the Eldredge Electric Manufacturing Company, Springfield, Mass.

The Automatic Transportation Company, Buffalo, N. Y., builds an electric truck especially designed and constructed for handling baggage and freight at railway and steamship terminals, etc. The truck is said to accomplish a definite saving of from twenty-five per cent to thirty per cent over the former mode of hand trucking.

### Machinery Manufacturers and Supply Men to Hold Triple Convention.

The next triple convention of the American Supply and Machinery Manufacturers' Association, National Supply and Machinery Dealers' Association and Southern Supply and Machinery Dealers' Association will be held at Norfolk, Va., on Monday, Tuesday and Wednesday, May 13, 14 and 15, 1912. The convention headquarters will be at the Monticello Hotel.

### A Market for American Lamps.

The Stores and Contracts Committee of the London County Council has recommended the use of foreign-made electric lamps, the prices being about 21 per cent less than those quoted in the lowest tender for lamps of British make, and about 20 per cent below the prices paid under contract for British lamps.

| | Volts. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 120 | 125 |
| Amperes | Watts. | | | | | | | | | | | | | |
| 0.1 | 10.0 | 10.5 | 10.6 | 10.7 | 10.8 | 10.9 | 11.0 | 11.1 | 11.2 | 11.3 | 11.4 | 11.5 | 12.0 | 12.5 |
| 0.2 | 20.0 | 21.0 | 21.2 | 21.4 | 21.6 | 21.8 | 22.0 | 22.2 | 22.4 | 22.6 | 22.8 | 23.0 | 24.0 | 25.0 |
| 0.3 | 30.0 | 31.5 | 31.8 | 32.1 | 32.4 | 32.7 | 33.0 | 33.3 | 33.6 | 33.9 | 34.2 | 34.5 | 36.0 | 37.5 |
| 0.4 | 40.0 | 42.0 | 42.4 | 42.8 | 43.2 | 43.6 | 44.0 | 44.4 | 44.8 | 45.2 | 45.6 | 46.0 | 48.0 | 50.0 |
| 0.5 | 50.0 | 52.5 | 53.0 | 53.5 | 54.0 | 54.5 | 55.0 | 55.5 | 56.0 | 56.5 | 57.0 | 57.5 | 60.0 | 62.5 |
| 0.6 | 60.0 | 63.0 | 63.6 | 64.2 | 64.8 | 65.4 | 66.0 | 66.6 | 67.2 | 67.8 | 68.4 | 69.0 | 72.0 | 75.0 |
| 0.7 | 70.0 | 73.5 | 74.2 | 74.9 | 75.6 | 76.3 | 77.0 | 77.7 | 78.4 | 79.1 | 79.8 | 80.5 | 84.0 | 87.5 |
| 0.8 | 80.0 | 84.0 | 84.8 | 85.6 | 86.4 | 87.2 | 88.0 | 88.8 | 89.6 | 90.4 | 91.2 | 92.0 | 96.0 | 100 |
| 0.9 | 90.0 | 94.5 | 95.4 | 96.3 | 97.2 | 98.1 | 99.0 | 99.9 | 101. | 102. | 103. | 104 | 108 | 112 |
| 1.0 | 100 | 105 | 106 | 107 | 108 | 109 | 110 | 111. | 112 | 113 | 114. | 115 | 120 | 125 |

(Power Factor, 1.00.)

Watt Chart.

### Porcelain Bushings.

A new idea in porcelain clamp bushing insulators is being placed on the market by the American Bushing Company, of Chicago, which the company claims to be simpler, superior and cheaper than anything now on the market.

Porcelain Clamp Bushing Insulator.

It consists of a vitrified porcelain bushing on the neck of which (diametrically opposite) are several slots or indentations as shown in Fig. 1, and a steel clamp (Fig. 2) with spring arms which, when placed into position in any of the slots (according to the thickness of the metal or other substance) at once forms an absolutely tight fastening which locks itself automatically (see Fig. 2 A). Fig. 3 shows the reverse or inside of box and bushing.

The same clamping device is also used in a new Outlet Box and Sign Socket which the above firm manufactures.

### A Storage-Battery Locomotive in Mine Service.

The problem of rapid haulage in mine tunnels is one that has given mining engineers considerable worry. Old-style small cars either pulled by hand or hauled by mules are going out of date. Steam locomotives are manifestly not fitted to this service on account of the smoke and gas which they give off. Compressed-air locomotives have been used to a considerable extent; the chief objections to them are their low efficiency and the fact that they can make only short runs on one charge. Electricity is the ideal power.

Electric trolley locomotives are open to the objection that in mine tunnels with small headroom the bare trolley wire is dangerous to employees, and in some mines also the sparks between the trolley and the wire must be avoided. The storage-battery locomotive overcomes all these objections. It has ample power, is very compact and can operate almost continuously, if the batteries are carried in an auxiliary tender which can be changed at intervals.

An installation of this kind has recently been made at the Big Five Tunnel, Ore Reduction & Transportation Company, Idaho Springs, Colo. This locomotive, which is shown in Fig. 1, handles trains of thirty cars of 2.5 tons each at a speed of 4.5 miles per hour. The gauge of the track is twenty-four inches. The locomotive has two seventeen-horsepower motors and has a maximum height over all of 50 inches, width 38 inches, length 108 inches.

The Edison storage battery was chosen for this service on account of its light weight, ability to withstand shock and vibration and because it can be charged at a high rate. The battery equipment is placed on the tender and consists of 208 cells of the A-6 type giving 250 volts and rated at 225 ampere-hours. This high voltage was chosen so that the locomotive can also be operated from an overhead trolley outside the mine. This battery furnishes power for five round trips over a three-mile round. The present tonnage of the mine is entirely handled on one charge per day.

Fig. 2 shows the arrangement of the battery in the tender.

Fig. 1.—Storage Battery Locomotive.

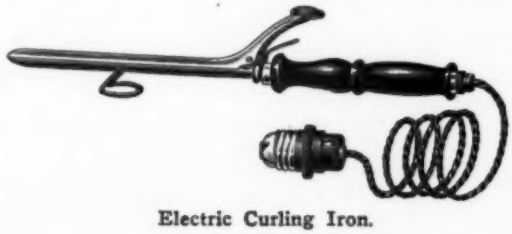
Fig. 2.—Arrangement of Battery in Tender.

The locomotive was built by the Westinghouse Electric & Manufacturing Company under specifications prepared by Barnes & Youtsey, engineers, Denver, Colo.

### The Pelouze Electric Curling Iron.

The Pelouze Electric Heater Company, Chicago, Ill., has placed on the market the Pelouze curling iron illustrated herewith. This iron has several good features, one of which is that it heats very quickly. It retains the heat well, and is economical in the consumption of current.

The amount of current taken is of course inconsiderable, and the coils are so wound that the maximum temperature reached is below that which would scorch the hair.



Electric Curling Iron.

The handle and frame of the iron are made to revolve around the heating element, to which the cord is attached; and the cord is thus saved from wear and kept from knotting while in use.

This form of iron is very popular as a traveling convenience, owing to its light weight and sturdy construction.

### An Electrically Operated Shovel for Railroad Work.

An electric shovel is used by the United Railways Company, of St. Louis, Mo., in excavating the trench twenty-one inches deep required for the ballast, ties and nine-inch rail of its track. The rails and old ties are torn up with cranes, which leaves some of the ties in the dirt, from which the shovel has no difficulty in removing them. Under such conditions the shovel averages about 300 feet of track in ten hours. It leaves a smooth bottom, but the sides of the trench have to be shaped by hand. The trench is excavated and the earth left beside it at about half the cost of hand work, and at much less if the street conditions permit the shovel to deliver the material directly into cars or wagons. In cases where this cannot be done, the trenching is done during the day and the loading at night. The shovel is a five-eighths-yard machine built by the Thew Automatic Shovel Company, with all the movements actuated by a thirty-horsepower motor. Where the trench is dug on rough ground, the truck of the shovel is run on short sections of temporary track, which are moved from the rear to the front as the work proceeds. In city streets where the cut is shallow and the trench can be opened more quickly, the truck of the shovel is supported on a special frame of steel shapes, which is provided with wheels for a track of ten-foot gauge, with the trench between the rails.—*Engineering Record.*

### Exports of Copper.

Exports of copper for the week ended December 30 were 9,511 tons. The amount since December 1, was 24,755 tons, compared with 23,224 last year.

### The Faraday Society.

The sixty-first meeting of the Faraday Society was held on Wednesday, December 6, 1911, at the Institution of Electrical Engineers, London.

F. J. Brislee presented a paper entitled "A Redetermination of the Density and Coefficient of Lineal Expansion of Aluminium."

W. R. Cooper exhibited and described some of the latest forms of the Benkö primary battery.

The elements of this cell are carbon and zinc, and the electrolyte a bichromate solution, preferably of the sodium salt. Its essential feature is the use of a porous carbon electrode through which the electrolyte flows under pressure, thus reducing polarization to a minimum. The carbon, which is the external element, is shaped like a flattened cylinder and is covered with a shell of lead. In the small space between the two the electrolyte is introduced under a head and it flows right through the carbon to the zinc and, thence to waste.

The electromotiveforce is two volts, and a cell weighing 10 pounds (excluding electrolyte), and having dimensions 9.25 inches high, 6.25 inches long, and 1.75 inches wide, gives a steady current up to, say, 25 amperes at 1.5 volts. The normal flow of electrolyte is one-half liter per hour per cell, and the internal resistance is below 0.01 ohm, which is very low. Since there is no difficulty in keeping it in order, the cell is very suitable for laboratory work, or where the cost of running is not of prime importance.

In a new form of cell exhibited the electrolyte passes through the carbon by diffusion, very concentrated electrolyte being introduced into the outer and water into the inner compartment; or fairly strong sulphuric acid may be used in the outer and strong bichromate solution in the inner compartment. In either case the solution round the zinc is very slightly acid and a zinc efficiency of 90 per cent is claimed. Obviously the diffusion type cannot give current continuously like the pressure type, but the cells are likely to prove very useful in telegraph, motor-car lighting, and for hand-lamps. Probably, too, a successful miners' lamp will be produced, capable of burning for two periods of eight hours on consecutive days. This has already been accomplished on a laboratory scale.

### Shawinigan Falls Plant Begins Operation.

The first 14,000-kilowatt unit has been placed in service in the 75,000-horsepower hydroelectric plant at Shawinigan Falls, eighty-five miles from Montreal, Canada, to which the energy is transmitted at 100,000 volts.

### Electric Towing in the Panama Canal Locks.

In the *Scientific American* of December 30, is given a review of progress achieved in the building of the Panama Canal during 1911. There are excellent prospects for the completion of the canal by July 1, 1913, or eighteen months before the original estimate. The illustrations with the article give an excellent idea of the magnitude of the design of the Gatun and Pedro Miguel locks. The former will be the largest in the world. They will be in three flights with a total lift of 85 feet. The locks will be double, one set for ascending and the other for descending.

Ships will not pass through the locks under their own power. Each ship will be taken in hand by four powerful electric locomotives, one off each bow and one off each quarter. The arrangement of the locks and towing tracks is well shown by the frontispiece of the article referred to. The locomotives will each weigh 70,000 pounds. They will be driven by electric motors, operating gears which will engage a rack rail, and the hawsers from the ship will be attached to the windlasses of the locomotives, which will be provided with friction clutches, that will prevent the drums sustaining a pull of more than 25,000 pounds. The speed of the ships, when in tow of the locomotives, will be not over two miles per hour. The provision of rack-rail traction, and the power and number of the locomotives, combined with careful operation, will practically eliminate any risks to the locks during the passage of vessels. These locomotives were described in more detail in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of November 11, page 994.

### Niagara Falls Electric Pumping Station Completed and Tested.

The new electrically driven municipal water works of Niagara Falls, N. Y., has been completed, tested and placed in operation. The plant contains three single-stage centrifugal pumps, each rated at 4,200 gallons a minute, and six multi-stage centrifugal pumps of similar rating, but higher head. In the tests each pumping unit with its motor showed a considerably greater capacity and higher efficiency than guaranteed under the contract. Electrical energy is supplied at 11,000 volts from two of the large hydroelectric power companies. A bank of three transformers, each rated at 600 kilowatts, steps down the voltage to 480 for the motor circuits. The new plant takes water from the upper Niagara River and passes it under pressure through a purification plant equipped for three purifying processes—coagulation, sedimentation and filtration. All the pumping equipment was furnished by the Allis-Chalmers Company.

### Only Three-Per-Cent Voltage Drop in Test of a 273-Mile Transmission Line.

A very interesting test is recorded in the January issue of the *Electrical News*, of Toronto, Canada. P. W. Sothman, chief engineer of the Ontario Hydroelectric Power Commission, recently switched over the lines covering southwestern Ontario in such a way as to obtain one continuous transmission circuit of 273 miles. The current was transmitted from Niagara Falls to Dundas, to Woodstock, to London, to St. Marys, to Stratford, to Guelph, back to Dundas, on to Toronto, back to Port Credit, back to Dundas, making a total distance of 273 miles. Over the first 242 miles of this circuit transmission was at 110,000 volts, but at Port Credit the voltage was stepped down to 13,200 volts and transmission was made from Port Credit back to Dundas, a distance of 31 miles, over the 110,000-volt line, but at 13,200 volts.

This test was made by Mr. Sotham with a view to determining the drop in voltage over a line of such great length. To this end two instruments uniformly calibrated were placed side by side in the Dundas station, one of these being connected with the local low-tension line, and read 13,200 volts, the other being connected with the low-tension line when it returned from Port Credit after transversing the full length of the 273 miles. The second instrument read 12,800 volts, a drop of only three per cent.

As further confirmatory evidence that this distance is well within the range of satisfactory transmission at 110,000 volts, Mr. Sothman states that the test was made without knowledge of any of the engineers in charge along the line at the various stations. While the test was being made these operators were telephoned for a report on conditions and without exception replied that everything was quite satisfactory and normal. To the very last station no operator had noticed any appreciable fall in the voltage of the line. The load on the line at the time of the test was approximately 8,000 kilowatts.

### Wireless for Armed Automobiles.

The Government of Guatemala has ordered from a motor car company of this city, through its New York agency, three automobiles to be equipped with machine guns and wireless apparatus for use in war. The cars will be the standard 1912 chassis, with a pony tonneau body.

The wireless set will have a thirty-five foot mast. It will be operated with the regular dynamo used for lighting and starting and will be good for communication at a distance of fifty miles.

## PRODUCTION OF COPPER IN 1911.

### Output Exceeds That of 1910, According to United States Geological Survey.

Statistics and estimates received by the United States Geological Survey from all plants known to produce blister copper from domestic ores and from all Lake mines indicate that the copper output from the United States in 1911 exceeded that of 1910 and nearly equaled the record production of 1909.

**Smelter Production.**

The figures showing smelter production from domestic ore, which have been collected by B. S. Butler, of the Survey, represent the actual production of each company for eleven months and include an estimate of the December output. The November figures for a few companies were not available and these companies furnished estimates for the last two months of the year. According to the statistics and estimates received, the cutput of blister and Lake copper was 1,091,554,000 pounds, against 1,080,159,509 pounds in 1910 and 1,092,951,624 pounds in 1909.

**Refined Copper.**

Statistics showing the output of refined copper by plants in the United States are not collected by the Geological Survey at this time. Figures published by the Copper Producers' Association for the first eleven months of 1910 indicate that the production of marketable copper by the regular refining plants from all sources, domestic and foreign, will amount to about 1,428,000,000 pounds, against 1,453,000,000 pounds in 1910.

**Imports.**

According to the Bureau of Statistics, imports of pigs, bars, ingots, plates, and old copper for the first eleven months amounted to 244,879,504 pounds, and the copper content of ore, matte, and regulus imported amounted to 63,466,781 pounds. If the imports for December were equal to the average monthly import for the first eleven months the amount of copper entering the United States for the year was about 336,000,000 pounds, against 344,435,771 pounds in 1910.

**Exports.**

Estimates based on figures for the first eleven months, published by the Bureau of Statistics and also by the Copper Producers' Association, indicate that the exports of copper will considerably exceed the exports of 1910, and that they may be as much as 750,000,000 pounds.

**Stocks.**

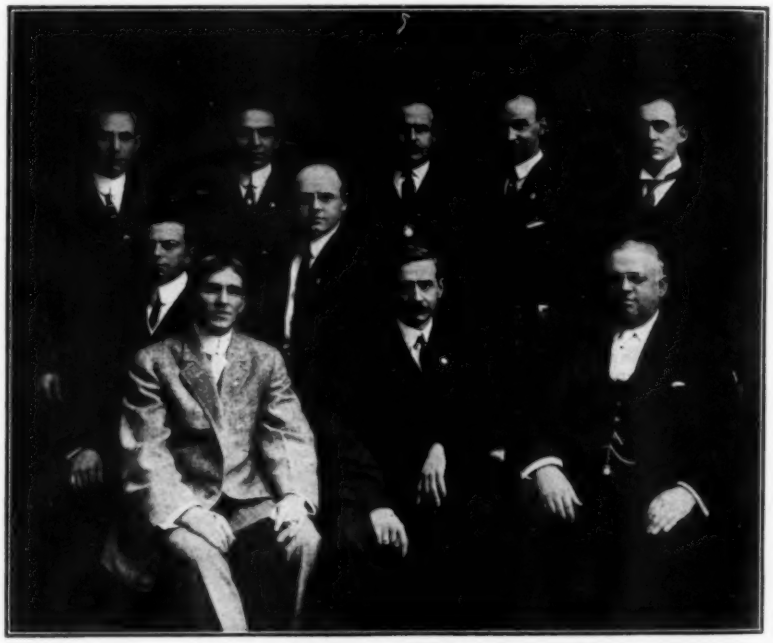
Stocks of refined copper held in the United States on January 1, 1912, are probably somewhat less than on January 1, 1911, and foreign stocks are also less. Both domestic and foreign stocks have been materially reduced since the middle of the year.

**Consumption.**

Statistics showing the domestic deliveries for the first eleven months of the year, as given by the Copper Producers' Association, indicate a considerable decrease in domestic consumption compared with 1910. It may, however, actually exceed 700,000,000 pounds.

**Prices.**

The average quoted price of electrolytic copper for the year showed a further decline from the average for 1910. The average for 1911 was nearly 12.4 cents a pound, compared with 12.74 cents for 1910. Near the close of the year copper was selling at a higher figure, the average price for December being materially above that for the year.



Group of Prominent Jovians.

### A Group of Prominent Jovians.

Upon the occasion of the return to Pittsburgh of the fighting squadron of Jovians who carried the election of Robert L. Jaynes as Tenth Jupiter of the Rejuvenated Sons of Jove at the recent Jovian Convention at Denver, Colorado, a banquet was held at the Fort Pitt Hotel and participated in by some three hundred odd Jovians and their friends. Speeches were made and congratulations heaped upon the happy Jupiter-elect and the stanch supporters who had worked so valiantly for his election. The only one of the fighting squadron missing from the group portrait shown herewith is Victor Gates, of the Safety Armorite Conduit Company, of Pittsburgh. Mr. Gates continued to the Coast while his brother Jovians returned to their enthusiastic city.

The Pittsburgh Jovians are working mightily for a big increase in the general membership and they promise a series of rejuvenations that will add greatly to the interest and effectiveness of the work of the order. Plans are already being outlined for the annual rejuvenation next October, and it is expected that this occasion will eclipse all previous demonstrations conducted by the Sons of Jove.

In the group portrait shown herewith those standing are Henry Harris, of the United Electric Light Company, Wilmerding, Pa.; Frank Knapp, General Electric Company, Pittsburgh; Robert L. Jaynes, Tenth Jupiter, Pittsburgh; W. Denny Shaler, secretary, Doubleday-Hill Electric Company, Pittsburgh, and J. E. McKirdy, publicity manager, Allegheny County Lighting Company, Pittsburgh. In the second row: Charles E. Marsh, Pittsburgh, passenger agent of the Atchison, Topeka & Santa Fe Railway, and George H. Criss, Westinghouse Electric & Manufacturing Company. Those seated are James L. Thompson, president, J. L. Thompson & Company, Pittsburgh; James G. Pomeroy, sales manager, Adams-Bagnall Electric Company, Cleveland, Ohio; and H. B. Kirkland, vice-president and sales manager of the American Conduit Manufacturing Company, Pittsburgh.

# Latest Approved Fittings

**BROODER.**

Adaptable Electric Hover.

Electrically heated brooders (Class A), shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, Inc., have labels attached.

Approved November 24, 1911.

**Cyphers Incubator Company, Buffalo, N. Y.**

**CONDUIT BOXES.**

"Union" pressed steel boxes for use with rigid conduit. Catalog Nos. 109-L, 113, 113-L, 114, 115, 180 (galvanized or enameled finish).

For use with flexible tubing, Catalog No. 200.

Approved November 28, 1911.

**Chicago Fuse Manufacturing Company, 1014-1020 W. Congress St., Chicago.**

**CUTOUT BASES, CARTRIDGE FUSE.**

"Diamond H" Meter Connection Blocks; Type A-20, 20A., 250V. A special porcelain base cutout arranged for meter installation and testing connections and enclosed in a sealable sheet metal cabinet.

Approved November 20, 1911.

**Hart Manufacturing Company, 103 Allyn St., Hartford, Conn.**

**Brooder, Cyphers Incubator Company.**

**CUTOUT BASES, LINK FUSE.**

"Diamond H" Meter Connection Blocks; Types E-80, 80A., 250V.; Type E-150, 150A., 250V.

Special Alberene Stone cutout bases arranged for meter installation and testing connections, and enclosed in a sealable metal cabinet.

Approved November 20, 1911.

**Hart Manufacturing Company, 103 Allyn St., Hartford. Conn.**

**ELECTRICAL HEATER FOR INCUBATORS AND BROODERS.**

"Electroplane." An electric heater (1 ampere, 100-125 volts), designed for use in incubators or brooders.

When this device is installed with one-half-inch air space on all sides, incubators or brooders so equipped are included in Class A, National Board rules.

These heaters, shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, Inc., have labels attached.

This manufacturer is equipped to supply these devices so labeled.

Approved November 22, 1911.

**Cyphers Incubator Company, Buffalo, N. Y.**

**Ground Clamp, Benjamin Electric Manufacturing Company.**

**FIXTURES.**

Standard Electric and Combination Fixtures.

Approved December 11, 1911.

**The Columbia Gas Fixture Company, 22-26 Howard St., New York, N. Y.**

**Hanger Board, Thompson Electric Works.**

**FIXTURES.**

A cast-iron fixture body for straight electric or combination fixtures; composed of two cast-iron rings threaded together on a central stem forming a clamp to hold the branch arm located in slots cut into the rim of one of the cast-iron rings with keys entering the tubing of the arms to prevent twising or longitudinal movements.

Approved November 20, 1911.

**Jacob J. Raithel, 2901 St. Louis Ave., St. Louis, Mo.**

**GROUND CLAMPS.**

These devices consist of straps of tinned copper provided with suitably spaced holes and with bolts for clamping pipes of different sizes.

First size for ½-inch, ¾-inch, and 1-inch iron pipe.

Second size for 1¼-inch, 1½-inch and 2-inch iron pipe.

Third size for 2-inch, 2½-inch, and 3-inch iron pipe.

Approved November 20, 1911.

**Benjamin Electric Mfg. Co., 120-128 S. Sangamon Street, Chicago.**

**HANGER-BOARDS, ARC LAMPS.**

A two-part interlocking hanger, the upper portion being stationary and connected to the line wires while the lower part carrying the lamp may be raised and lowered by means of pulleys and a cord.

The engaging of the parts automatically secures the mechanical and electrical connections by the weight of the lamp, but by raising the lamp slightly with a quick pull the parts are readily separated.

Approved November 28, 1911.

**Thompson Electric Works, Cleveland, Ohio.**

**INCUBATORS, ELECTRICALLY HEATED.**

**Incubator, Cyphers Incubator Company.**

"Electrobator." Electrically heated metal or wooden case incubators.

"Electrohens" and "Toy Incubators." Metal cases with heaters consisting of incandescent lamps.

Electrically heated incubators (Class A), shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board

of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, Inc., have labels.

**Cyphers Incubator Company, Buffalo, N. Y.**

**INSULATING MATERIALS.**

"Gummon." This is a molded insulating material of high di-electric strength. It is practically non-combustible and, although somewhat brittle, has moderate mechanical strength. It will absorb but little water and is affected little, if at all, by oils or acids. It is suitable for use for parts of electrical appliances requiring a material of the properties indicated above.

Approved December 11, 1911.

**Hemming Manufacturing Company, Garfield, N. J.**

**INSULATING MATERIALS.**

"Hemit B." This is a molded insulating material of high di-electric strength. It is non-combustible and but little affected by high temperatures. It has excellent mechanical strength. It will absorb but little water and is affected but little by oils or acids. It is suitable for use where material molded in plain shapes or flat pieces and having the properties indicated above is required for parts or bases of electrical appliances.

Approved December 11, 1911.

**Hemming Manufacturing Company, Garfield, N. Y.**

**INSULATING MATERIALS.**

"Hemit B." This is a molded insulating material of fair mechanical and moderate dielectric strength, possessing the ability to resist fairly high temperatures. It is somewhat absorptive, but is little affected by oils

**Receptacle, Pass & Seymour.**

or acids. In plain shapes, principally flat pieces, it is suitable for use as an arc deflector, or for other parts of electrical devices requiring a material having the above properties.

Approved December 11, 1911.

**Hemming Manufacturing Company, Garfield, N. J.**

**INSULATING MATERIALS.**

"Tegit." This is a molded insulating material of high dielectric and mechanical strength. It is not strictly non-combustible, but its absorption of moisture is small, and it is not affected by oils and very slightly by acids. It is suitable for use in electrical appliances where it will not be exposed to temperatures in excess of 400 degrees Fahrenheit, nor to the direct action of water.

Approved December 11, 1911.

**Hemming Manufacturing Company, Garfield, N. J.**

**PANELBOARDS.**

"Standard" and "Universal" Panelboards.

"McWilliams Meterite" Metering Panels.

Approved November 10, 1911.

**J. Lang Electric Company, 423 N. Lincoln St., Chicago, Ill.**

**RECEPTACLES, STANDARD.**

Porcelain Shell, 660W. 250V.

Sign or Conduit Box Type, Catalogue No. 700.

Approved November 20, 1911.

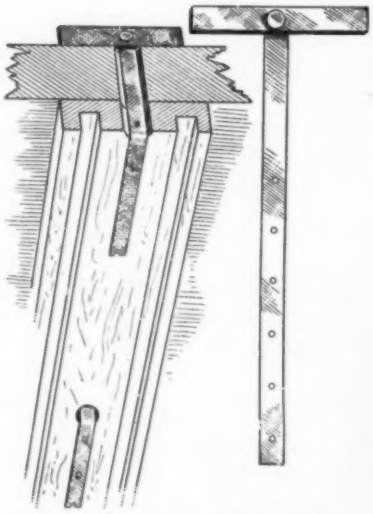
**Union Electric Company, Hamilton Ave. & Clark St., Trenton, N. J.**

**RECEPTACLES, STANDARD, FOR SUB-BASES.**

"P. & S." Porcelain Sub-Bases, Catalogue No. 62.

Approved December 14, 1911.

**Pass & Seymour, Incorporated, Solvay, N. Y.**



**Toggles, Conlan Electric Company.**

**SHOW WINDOW DISPLAY FIXTURE.**

Advertising display fixture, 660W., 110V., A. C. or D. C. This advertising novelty for use in show windows, is constructed in the form of a candy box, the cover of which is opened and closed by a motor-driven mechanism, disclosing a photographic transparency illuminated by incandescent lamps contained within the box.

Connection to the supply circuit is made by means of steel armored portable flexible cord and approved attachment plug.

Approved November 28, 1911.

**Geo. T. Fielding & Company, 575 Pelham Ave., New York, N. Y.**

**SHOCK ABSORBER, "MAZDA."**

For pendants, consists of a spring wire formed into a cylinder with tapering ends fitted with porcelain bushings for the flexible cord which passes continuously through the fitting with a slack portion between two knots which bear against the inner ends of the bushings.

Approved November 2, 1911.

**American Arc Lamp Company, Kalamazoo, Mich.**

**SOCKETS, STANDARD.**

Pull, "Bayonet," Catalogue Nos. 93-96, inclusive.

Approved November 28, 1911.

**Pass & Seymour, Incorporated, Solvay, N. Y.**

**SWITCHES, KNIFE.**

Special heater switches with slate bases.

30A., 250V., Catalogue Nos. 159906-159907.

60A., 250V., Catalogue No. 159908.

Approved November 28, 1911.

**The Bryant Electric Company, Bridgeport, Conn.**

For Westinghouse Electric & Mfg. Company, Pittsburgh, Pa.

**SWITCHES, SURFACE SNAP.**

"G. E. Series-Parallel."

Special heater switches for connecting the two elements of an electric heater in parallel or series, or a single element across the supply.

10A., 250V., Catalogue No. 105601, for use only as a part of General Electric Company's heaters.

20A., 250V., Catalogue No. 105600.

Approved December 14, 1911.

**General Electric Company, Schnectady, N. Y.**

**TOGGLES.**

Type "A" for supporting molding.

Type "B" for supporting conduit.

A strap metal toggle with a rivet holding a strap for supporting molding and wire for conduit.

**Switch, General Electric Company.**

Approved November 28, 1911.

**Conlan Electric Company, 43 Murray St., New York, N. Y.**

**TRANSFORMERS.**

"Mazda Transformers." Air-cooled auto-transformers for indoor and outdoor use with low-voltage incandescent lamps, 110 volts primary, 11 volts secondary, one-fourth to two K. W. capacity.

Approved December 11, 1911.

**Pittsburgh Transformer Company, Pittsburgh, Pa.**

A company has secured the concession and has begun work to develop two waterfalls in the Pyrenees Mountains of Spain. One of these has a head of 2,400 and is expected to develop about 30,000 horsepower. Power will be transmitted over duplicate transmission lines to th city of Barclona, where an auxiliary steam plant will be built.

# Current Electrical News

## LIGHTING AND POWER.

*(Special Correspondence.)*

DONNA, TEX.—B. H. Hooks and others are to organize an electric light company.

ALLISON, IOWA.—Claude Mackey has been granted an electric-light franchise here.

MOKANE, MO.—C. E. Mosley is about to establish an electric light plant here.

SELKIRK, MAN.—Bonds for $25,000 will be issued to build a municipal electric light plant.

DEVILS LAKE, N. D.—Bonds for $33,000 have been voted for a municipal lighting plant.

BOUTON, IOWA.—Contracts will soon be let to build and maintain an electric-lighting system.

SCOTT CITY, KAS.—Bonds have been voted for the establishment of an electric-light plant.

MITCHELLVILLE, IOWA.—George T. Gibson is about to install an electric light plant.

SCHENECTADY, N. Y.—A municipal lighting plant is under considerattion for Schenectady.

GRANDVIEW, MO.—J. E. Fred and others propose to put in an electric light plant here.

GRAND SALINE, TEX.—The Grand Saline electric light plant has been destroyed by fire.

MT. CORY, O.—Residents of this place are planning to install a municipal lighting system here.

SEADRIFT, TEX.—C. W. Huff, of Corpus Christi, Tex., has secured an electric light franchise here.

CLARA CITY, MINN.—An electric-light franchise has been granted to Charles Bush and E. Behrends.

MORRISTOWN, MINN.—The Consumers Power Company has been granted a local lighting franchise.

CALVERT, TEX.—The Calvert Water, Ice & Electric Light Company has secured a fifty-year franchise.

TIOGA, TEX.—C. B. Glasscock has been granted a franchise for an electric light and power plant in Tioga.

KEOKUK, IOWA.—The Keokuk Electric Company has been incorporated with a capital stock of $650,000.

LA GRANGE, GA.—The Georgia Railway & Power Company is planning to build a power station at this point.

WICHITA FALLS, TEX.—The Falls Electric Company has been incorporated with a capital stock of $5,000.

MIDDLETOWN, O.—Mr. Nein of the Grand Theatre is going to have installed a private lighting system for the theatre.

WAGONER, OKLA.—$45,000 in bonds have been voted for the improvement of the water and electric lighting system.

OMAHA, NEB.—The Electric Light Company has asked to be allowed to install flaming arc lamps and for an extension of franchise.

EATONTOWN, N. J.—Electric lights are to be installed on the principal streets. Five are to be arc lights and thirty-two tungstens.

TUCUMCARI, N. M.—The Tucumcari Light & Power Company has adopted plans for the new power plant which it will install here. D.

ANTIOCH, CAL.—The City Trustees plan for the erection of a municipal electric-lighting plant. The promotion Association is interested. A.

DOWS, IOWA.—There is a plan on foot to run a long-distance transmission line from Iowa Falls to this city to supply electric-light service.

CHATTANOOGA, TENN.—A hydroelectric power plant of many thousands horsepower is to be erected in the Tennessee River near Chattanooga.

FORT DODGE, IOWA.—The Northern Iowa Power Company has been organized and will establish a hydroelectric plant north of this city.

CANANEA, MEX.—The Lampasas Silver Mines Company is said to be planning for the erection of a new power plant supplying its Lampasas mine. A.

ALLISON, IOWA.—It has been decided to grant a franchise to Claude Mackey of Waverly for the installation of an electric-light system in Allison.

PROVINCETON, MASS.—The Cape Light, Heat & Power Company will considerably increase the number of street lights here at their own expense.

BLACKHORSE, NEV.—The Amalgamated Nevada Mines Company plans for the installation of new air-compressor machinery. H. F. Sanborn is manager. A.

ELLENSBURG, WASH.—Cluster lights will be installed on all the business streets early in February, according to a decision reached by the Council recently.

SUMNER, WASH.—In connection with its proposed yeast manufacturing plant at Sumner, the Fleischmann Company, Pine Street, Seattle, will build an electric power plant. A.

COTTAGE GROVE, ORE.—O. J. Young, Ashland, Ore., is at the head of an association of mining men who plan for the erection of an electric-smelting plant at Cottage Grove. A.

SPARTA, MICH.—The grain elevator, electric light plant and coal yard of the Sparta Milling Company were destroyed by fire December 20, entailing a loss of $200,000.

OAK BAY, B. C.—The City Council has instructed the city clerk to advertise for bids for the installation of a street-lighting system. A.

SANTA BARBARA, CAL.—Plans are being laid at Oxnard for a street-lighting system. It is estimated that the system with underground wires can be installed for $25,000.

DOUGLAS, ARIZ.—The Douglas Investing Company has been incorporated with capital stock of $1,500,000. A power line for Sulphur Springs Valley is under consideration.

WAYZATA, MINN.—W. D. Lovell, Minneapolis, has been engaged by the village council to prepare plans and specifications for the new electric-lighting and water systems for the village. C.

MORENCI, ARIZ.—In a general plan for improvements and additions to its properties, the Arizona Copper Company includes the erection of a new power plant at Morenci. A.

IRONDALE, WASH.—The Olympic Power Company, Olympia, plans for the extension of its transmission line from Irondale to Bremerton, a distance of about forty miles. A.

CHARLTON, MASS.—The Webster Electric Light Company is agitating for street lights in Charlton City and along the highway connecting Charlton depot and Charlton.

GLENDORA, CAL.—The city plans for the installation of an electric street-lighting system along the most important thoroughfares. The City Engineer will be in charge of the work. A.

SPRINGFIELD, MASS.—Selectmen have approved the plan for additional street lights for this city and have arranged for their location. Arc and incandescent lights will be used.

ALLENTOWN, PA.—A boulevard system of street lighting is planned for Allentown and Messrs. Best and Morton have been elected a committee to have the matter in charge.

SPOKANE, WASH.—The Chilco Water & Light Company has been incorporated with a capital stock of $2,000. C. S. Argo and A. E. Gallagher are among the incorporators.

LOS ANGELES, CAL.—The City Electrician has prepared specifications calling for the addition to the city's lighting equipment of 500 new lamps. These to be added during the year 1912.

TRENTON, MO.—The Trenton Gas & Electric Company has been incorporated with a capital stock of $50,000. The incorporators are J. T. Menefee, Clarence O. Daniel and Jasper C. Young.

ALBERT LEA, MINN.—The Minnesota Gas & Electric Company, formerly the Albert Lea Light & Power Company, is contemplating large extensions of its business and the installation of a new power plant.

BEATTIE, KAN.—The City Council has passed an ordinance granting to

Harry D. Hockman a twenty-year franchise for the establishment and operation of an electric light, heating and power plant.

EAST ST. LOUIS, ILL.—The City Council has authorized the East St. Louis Electric Light and Power Company to string wires to Edgemont, the eastern limits of the city, for more street lights.

SAN FRANCISCO, CAL.—The Board of State Harbor Commissioners has granted the request of the Charles Nelson Company to install electric light clusters on its property at its own expense. A.

GREENFIELD, MASS.—The selectmen have taken up the problem of better lighting. A number of new lights have been ordered erected, some changes made and much better distribution effected.

LOS ANGELES, CAL.—R. H. Mansha, city electrician, has prepared specifications for street lighting for the coming year and they have been sent to the City Council with a request to advertise for bids.

ATCHISON, KANS.—A municipal electric light plant is possible for Atchison. Mayor Walker says that one can be installed for $75,000, and that a private citizen stands ready to furnish the money.

SOMERVILLE, MASS.—The Finance Committee has made the recommendation to the City Aldermen that a municipal lighting plant for the City Hall, Public Library and High School be installed.

FALL RIVER, MASS.—The Tiverton Electric Light Company has decided to increase its capital stock to $36,000. Part of the added capital is to be used in extension of several lines and additional equipment.

PITTSBURGH, PA.—The Council has passed an ordinance granting to the Pennsylvania Light, Heat & Power Company the right to extend its lines throughout the city into the twenty wards of the old city.

SALT LAKE CITY, UTAH.—A new system of street lighting is under consideration for Salt Lake City, it being decided by a Board of Governors of the Commercial Club that the present system is not as good as it should be.

COVINGTON, O.—The Buckeye Light & Power Company has been incorporated with a capital stock of $40,000. J. H. Marlin, A. W. Landis, John Weaver, John Fenemore and Hugh C. Marlin are among the incorporators.

YONKERS, N. Y.—It has been decided by the city officials, the merchants and the Yonkers Electric Light & Power Company to make extensive improvements in the lighting system on a large number of streets, using either tungsten or flaming arcs.

MUSKEGON, MICH.—The Grand Rapids-Muskegon Power Company is preparing to extend its transmission lines to the business and residence sections. The boulevard lighting system will be used. A new transmission line is also to be built to Croton.

OCEANSIDE, CAL.—The Oceanside Tent City Company, recently organized, plans for the establishment of a local tent city. A cluster street lighting system will be installed on the property opportioned for such purpose. G. A. Lane, Oceanside, is treasurer of the company. A.

CORYDON, IOWA.—J. J. C. Bower, town clerk, will receive bids until January 9, 3 p. m., for improvements to the electric light plant alternate oil-engine and steam propositions. Iowa Engineering Company, Clinton, Iowa, are the consulting engineers.

SACRAMENTO, CAL.—The California Consolidated Light and Power Company has given a deed of trust for $5,000,000 to secure a bond issue in that amount, the funds to be used in equipping the company to supply power to the new electric railroad being built.

SWANSEA, MASS.—The Seekonk Electric Light Company has been authorized to do business in Swansea and Seekonk. The company takes over the equipment of the Narragansett Company at the point where it crosses the state line and plans considerable extensions in both towns.

KIMBALL, W. VA.—The Russell Company, of Dayton, O., has taken over the fifty-year franchise which was previously granted Mr. Tobin, and will build and operate an electric light and power plant in this city. It is estimated that $50,000 will be necessary for the installation.

SANTA MONICA, CAL.—The storage warehouse of the Southern California Edison Company on Eighth Street, containing a stock of transformers, meters, copper wire, tools, etc., was destroyed by fire. The loss is estimated at $30,000. The building and equipment will be replaced. A.

BLUE LAKE, CAL.—The Western States Gas & Electric Company is making improvements in the electric lighting plant and system recently acquired from the Minor Mill & Lumber Company, and will connect the lines with the system of the purchasing company. H. L. Jackson is manager.

DALLAS IOWA.—The Rock Island railway has started work on a power house here, and it is rumored that the company will install a large power plant from which to generate electricity for the operation of freight and passenger trains over certain of its lines out of Des Moines. Carl Scholz, engineer, Chicago, is in charge of the work.

LUDINGTON, MICH.—In offering the city a five-year contract for street lights, the Stearns Lighting & Power Company has agreed to replace the arc system of lights in several instances with five beautiful fixtures of five ornamental lamps each. This improvement, if accepted by the city, will cost the Stearns Company $1,000.

CLEVELAND, O.—The W. H. Burton Company has been incorporated with a capital stock of $10,000. The object of this company is to manufacture, sell and furnish electric light and power, and steam in the city of Cleveland. H. W. Burton, C. F. Moore, Charles M. Collacott and R. T. Sawyer are named among the incorporators.

MONTPELIER IDA.—The Telluride (Colo.) Power Company has been granted an electric-lighting and power franchise at Montpelier. The grant provides that the company must have the proposed system in operation within nine months. The company is said to have applied for a similar franchise at Salt Lake City, Utah.

## ELECTRIC RAILWAYS.

*(Special Correspondence.)*

SOUTHAMPTON, MASS.—An electric road is proposed to run between Westfield and Southampton.

BROWNSVILLE, TEX.—A franchise has just been granted for the construction of a street railway system here.

NORTHFIELD, MINN.—The Dan Patch Line proposes an extension from this city to Faribault and Owatonna next season. C.

PASADENA, CAL.—The Pacific Electric Railway Company has been granted a franchise for a line on Washington Street.

SAINT BONIFACE, MAN.—The plans of the Street Railway Company have been approved for making a couple of belts in the city.

PERRY, IOWA.—The Perry Electric Railway Company has been incorporated with a capital of $100,000, by B. C. Dilenbeck and others.

TYLER, TEX.—It is contemplated to build a street car system in Tyler, and it is probable that work will be started the first of the year.

DENISON, TEX.—Plans are under way for the building of a local car line to South and Southeast Denison by the Texas Traction Company.

MUSCATINE, IOWA.—William S. Dows, of Cedar Rapids, is promoting an interurban between Muscatine and Iowa City. The detail survey has been made. C.

PROVIDENCE, R. I.—The Street Railway Company will double-track the entire section of Plainfield Street from Olneyville Square to Webster Avenue.

SACRAMENTO, CAL.—The bid of the Sacramento Electric, Gas & Railway Company for a franchise in the annexed territory has been accepted and a franchise granted.

IOWA CITY, IOWA.—The Iowa City-Ottumwa electric interurban is claimed to have sufficient capital pledged to construct the line next season to Keota, at least. C.

TACOMA, WASH.—The Tacoma Railway & Power Company is considering the construction of an interurban line from Tacoma to Point Defiance, a distance of about seven miles. A.

WHITTIER, CAL.—The Pacific Electric Company has been requested by the City Council to put double tracks on West Philadelphia Street, where the line enters the city.

OKLAHOMA CITY, OKLA.—It is announced that the interurban railway between Muskogee and Fort Gibson will be completed to Oklahoma City on the west and Tahlequah on the east.

WAYCROSS, GA.—A company just organized is advertising for 25,000 cross ties, with Waycross delivery. This is the first move toward building a street and suburban railway system here.

SHERMAN, TEX.—The Tioga Traction Company has been formed to build an interurban railway from McKinney to Tioga, and possibly to Gainesville, with a capital stock of $600,000.

NORWALK, CONN.—It is stated that the management of the New Haven Road plans to electrify the Dan-

bury branch of its steam line running south from Norwalk to Brookfield Junction.

MINNEAPOLIS, MINN.—It is proposed to build in 1912 a crosstown street car line on Franklin Avenue. Alderman Frank Heywood, chairman of the Council Committee, has the matter in hand.

WHITE PLAINS, N. Y.—The Public Service Commission has approved the application of the Hudson River & Eastern Traction Company to extend its line from Ossining to White Plains.

YONKERS, N. Y.—Mr. Ingleton, of the Bryn Mawr Park Improvement Association announces that he has been assured that everything is being done to extend the trolley line from Yonkers to Bryn Mawr.

DENVER, COLO.—A new through street car line is planned for the coming year to run between Denver and Littleton. The Denver & South Platte Railway Company, it is understood, is to finance the project.

MOUNT VERNON, IOWA.—The Cedar Rapids and Iowa City Electric Light & Power Company have a project under way to build an interurban between Cedar Rapids and Mount Vernon that will include the Palisades.

LOUISVILLE, KY.—The Lower Board of the General Council has passed an ordinance giving the Louisville & Interurban Railway Company permission to construct and maintain double tracks on Bardstown Road.

HUTCHINSON, KAN.—A stock company has been formed to build an interurban road between the towns along the Hutchinson and Southern branch. The Hutchinson Commercial Club is co-operating in the movement.

BURLEY, IDA.—The trustees of the village have granted a franchise to Albert Ploeger, giving him the right to build, maintain and operate, for a period of fifty years, a street railway system upon the principal streets of the town.

VINCENNES, IND.—The Brindley Construction Company, New York, has received the contract for the construction of the line of the Vincennes, Washington & Eastern Traction Company, and are ready to let the subcontracts.

MOORHEAD, MINN.—The preliminary survey for the proposed Moorhead-Dilworth line of the Fargo & Moorhead Street Railway Company has been finished. The distance of the line has been measured at exactly three miles.

MANKATO, MINN.—There is a plan on foot to build a railway from Mankato to Duluth by way of Saint Cloud. The American Engineering & Construction Company, Cleveland, has submitted a proposition which may be accepted.

KELLOGG, IDA.— The Stewart Mining Company has had plans prepared for a motor tramway line operating from the portal of its new tunnel. The loaded cars will operate by gravity, the empties being hauled back by motor.

ATHOL, MASS.—The plans for a street railway line from Baldwinville to Winchendon, made by the Massachusetts Northern Railway Company, are well under way, and by spring everything will be in readiness for construction work.

PORTLAND, ORE.—The Southern Pacific Railroad Company will soon commence the electrification of its line on Fourth Street. A contract has been entered into with the Portland Railway, Light & Power Company for the delivery of 5,000 horsepower. A.

TACOMA, WASH.—The Pierce County Commissioners have notified the Seattle-Tacoma Short Line Company that its franchise will be extended until January 10, 1914, provided the company will expend $20,000 in improvements and extensions in the county within the next six months. A.

SEATTLE, WASH.—The Kirkland-Redmond Railway, Light & Power Company has been incorporated by C. A. Eaton, B. F. Gordon, William Perigo, S. G. Helper and W. D. Gillis, with a capital of $200,000. The construction of an electric railway from Kirkland to Redmond, a distance of about six miles, will soon be commenced. Headquarters of the company will be at Seattle. A.

BOISE, IDA.—The Southern Idaho Light, Heat & Power Company has been incorporated by William Mainland, O. G. Markhus, et al, with a capital stock of $20,000,000. The company, in the name of its president, William Mainland, has been granted a fifty-year franchise for the construction and operation of an electric railway line at Nampa, Idaho. The grant becomes void if the system is not started by July, 1912. A.

SACRAMENTO, CAL.—The Oakland, Antioch & Eastern Railway Company has asked for a franchise to operate interurban electric trains into this city. The road will enter the city over the big steel bridge now under construction by the Northern Electric. Vallejo Northern and Sacramento-Woodland electric lines and will build down the west side of the Sacramento River through the reclamation districts of Yolo County.

GREENVILLE, TEX.—The plans of the East Texas Traction Company for the construction of an interurban electric railway from Greenville to Paris, thence to Clarksville, also provide for the installation of a large power plant here at a cost of $400,000. The Mansfield Engineering Company of Indiana has made a survey and report on the project. It shows that the length of the proposed line will be 193 miles. Joseph F. Nichols of Greenville, who is at the head of the project, says that the work of constructing the line will commence early in the year. D.

FREDERICKTON, N. B.—The contract for the construction of the St. John Valley Railway, involving an expenditure between $5,000,000 and $6,000,000, has been signed. The parties to the contract are the New Brunswick Government and the St. John & Quebec Railway Company. It is expected that the work of construction will commence next spring. The route will be from a point on the National Transcontinental Railway near Grand Rapids, and will run via Centreville and Lake View to Woodstock, Fredericton, and Gagetown and thence to St. John City. The contract provides for the guaranteeing of the bonds by the province to the extent of $25,000 per mile.

## TELEPHONE AND TELEGRAPH.

*(Special Correspondence.)*

LYNN, WIS.—The Lynn Telephone Company has increased its capital stock to $2,080.

LA GRANDE, ORE.—The Corporative Telephone System is planning to extend its line to Union.

PARKMAN, OKLA.—The Parkman Telephone Company has been incorporated with a capital stock of $5,000.

MARYSVILLE, Mo.—The De Kalb County Telephone Company has been incorporated with a capital stock of $25,000.

BINGEN, WASH.—The residents of the White Salmon Valley are planning to build a telephone line from Trout Lake to Underwood, a distance of about three miles.

NOBLESVILLE, O.—The Deming Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are J. B. Sturdevant, Marion Jessup and Blanche Jessup.

CASCADE, WIS.—The Cascade Telephone Company has been incorporated with a capital stock of $3,000. J. E. Hoffman, J. H. Schleuter and A. Suemmich are incorporators.

LONG BEACH, CAL.—The Pacific Telephone & Telegraph Company has been granted a franchise at Long Beach. The grant renews the permission which expired in May, 1911. A.

GRAND RAPIDS, MICH.—Telephones have replaced the telegraph for train dispatching on the two divisions of the Pere Marquette Railroad System operating out of Grand Rapids.

SHAWANO, WIS.—The Red River Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are John T. Callahan, Joseph Lieg and A. J. Stieger.

CHICAGO, ILL.—Receivers of the Interstate Telephone & Telegraph Company have been authorized to sell 5,539 shares of unissued stock, the proceeds to be used to complete extension work.

ASHMORE, ILL.—The Ashmore Mutual Telephone Company has been incorporated with a capital stock of $2,500. The incorporators are J. C. Reed, W. R. Comstock, J. E. Dudley and R. A. Larrabee.

HANNIBAL, MO.—The plant of the Bluff City Telephone Company, which was destroyed by fire recently at a loss of $30,000, is to be rebuilt. Two thousand telephones were put out of commission by the fire.

OWENSBORO, KY.—The Hartford Telephone Company has filed articles of incorporation with a capital stock of $10,000. The stockholders are William W. Crawford, W. T. Hale and J. Joseph Hettinger, all of Louisville.

LITTLE FALLS, MINN.—John G. Bovie of Culdrum and Andrew Wahl of Pike Creek are two of the promoters of a new farmers' telephone line to be erected in the spring. This line is to serve about thirty-five patrons.

WEST NEWTON, PA.—The Sewickley Telephone Company has been organized here and the following officers elected: Oliver Lash, president; Roy Andrews, vice-president; Simon Sherbondy, secretary and Harry Milligan, treasurer.

## FINANCIAL NOTES.

During the last business week of the year speculative sentiment was somewhat mixed. That general trade conditions should be quiet is not uncommon and is rather the rule. It is pretty hard to do business of any volume during the holiday season and in both retail and wholesale circles, except for the handling of intensely seasonable novelties, things get quiet indeed. On the last day of the week stocks marked up vigorously, but it is expected that the reaction will come early in the month and that the first of February account will show a falling off from the present high figures. Earnings of electric light and power companies for the year have been very high, the gain in some instances being enormous. The great co-operative movement for the promotion of electrical sales now sweeping the country has already made very definite advances and it is expected that 1912 will be a banner year for the industry.

The Bondholders' Committee of the Allis-Chalmers Company, James N. Wallace, chairman, recently announced that it has arranged through its depository, the Central Trust Company, to advance to the bondholders the amount of the January 1 coupon on which the company had defaulted. The trust company will make a charge of five per cent on all bonds and coupons deposited under the bondholders' plan.

It is understood that the plan now in contemplation for reorganization of the Allis-Chalmers Company will call for an assessment on the preferred stockholders and common stocks, but it is not improbable that the stockholders will be asked to raise a considerable proportion of the additional working capital of which the company stands in need. The bond indebtedness will be cut down. While nothing is yet obtainable as to what disposition will be made of the $11,148,000 first-mortgage five-per-cent bonds in the hands of the public and the $800,000 additional which has been pledged as collateral for loans, the best opinion is that the bondholders will be asked to accept new preferred stock in whole or in part for their bonds. The question of a receivership is still in abeyance, though it is thought that such proceedings will be undertaken in behalf of the bondholders in due time. The company has splendid plants and a very efficient organization, and it is represented, from trustworthy sources, that the company will come out of its difficulties in good shape.

## SECURITIES.

Lethbridge, Alberta, Canada, has voted to issue $300,000 four and one-half per cent debenture street railway and $150,000 power plant debenture bonds, due 1942, which will be offered for sale in the spring.

Newburger, Henderson & Loeb and Bioren & Company, New York, are offering the unsold balance of $3,000,000 American Railways Company refunding convertible five per cent bonds, due August 1, 1931, at ninety-six and one-half and interest, yielding 5.30 per cent. The issue is tax exempt in Pennsylvania.

There was no change from last year in the list of street railway companies certified to by the Massachusetts Railroad Commissioners as fulfilling the requirements of the state savings bank law by earning and paying without impairment of assets five per cent dividends for the past five years. Ten street railway companies, including Boston Elevated Railway, Boston & Northern Street Railway and Boston & Revere Electric Railway, are in the list.

The Massachusetts Electric Companies has completed an important piece of refunding in the sale of $2,550,000 four-per-cent mortgage refunding bonds to a Boston syndicate. The bonds take care of all 1912 maturities and in every case but one represent a saving of one per cent in interest. This exception is an issue of about $300,000 six-per-cent bonds, where the saving in interest is two per cent. All of the other maturing issues are five per cent. One such issue, a block of $1,000,000 Lowell & Suburban Street Railway 5s, came due, as a matter of fact, December 1 of this year and has already been paid off. The saving in interest to the company through this refunding should amount to about $30,000 per annum. All of the bonds will not issue immediately, but in time to take up maturing obligations as they fall due at different periods throughout 1912. Thus overlapping of interest will be avoided. The sale of these bonds does not provide for construction requirements of the fiscal year of the operating companies to end June 30 next. Construction during that period will aggregate about $1,500,000, or practically the same as during the year to June 30, 1911.

### DIVIDENDS.

Aurora, Elgin & Chicago Railway Company; quarterly dividend of three-quarters per cent, payable January 10 to stock of record December 23.

Cincinnati, Newport & Covington Light & Traction Company; quarterly common dividend of one and one-quarter per cent, and preferred of one and one-eighth per cent, both payable January 15.

Electrical Securities Corporation; the regular quarterly dividend of two per cent on the common and one and one-quarter per cent on the preferred stocks. Common dividend is payable December 31, to stock of record December 29. Preferred dividend is payable February 1, to stock of record January 27.

Philadelphia Company; quarterly common dividend of one and one-half per cent, payable February 1 to stock of record January 2.

Syracuse Rapid Transit Company; quarterly common dividend of one per cent, and preferred of one and one-half per cent, both payable January 2.

### MEXICAN TELEGRAPH QUARTERLY REPORT.

The report of the Mexican Telegraph Company for the quarter ended December 31 (partly estimated) compares as follows:

| | 1911. | 1910. |
|---|---|---|
| Gross | $ 210,000 | $ 205,000 |
| Expenses | 42,000 | 37,500 |
| Net | 168,000 | 167,500 |
| Other income | 30,498 | 24,500 |
| Total income | 198,498 | 192,000 |
| Mex. government proportion | 11,500 | 9,500 |
| Balance | 186,998 | 182,500 |
| Dividends | 89,735 | 89,735 |
| Surplus | 97,263 | 92,765 |
| Previous surplus | 2,839,288 | 2,479,757 |
| Total surplus | 2,936,551 | 2,572,522 |

### CENTRAL & SOUTH AMERICAN TELEGRAPH.

The report of the Central & South American Telegraph Company for the quarter ended December 31, 1911 (partly estimated), compares as follows:

| | 1911. | 1910. |
|---|---|---|
| Gross | $ 447,500 | $ 435,500 |
| Expenses | 155,000 | 165,000 |
| Net | 292,500 | 270,500 |
| Other income | 1,750 | 1,250 |
| Total income | 294,250 | 271,750 |
| Dividends | 143,565 | 143,565 |
| Surplus | 150,685 | 128,185 |
| Previous surplus | 2,526,969 | 2,121,293 |
| Total surplus | 2,677,654 | 2,249,478 |

### PHILADELPHIA RAPID TRANSIT.

The Philadelphia Rapid Transit Company statement of earnings for the month of November and the five months of the fiscal year to date, is as follows:

| | November 1911. | 5 mos. to Nov. 30. |
|---|---|---|
| Gross passenger earnings | $1,804,353 | $8,971,466 |
| Receipts from other sources | 77,621 | 408,669 |
| | 1,881,975 | 9,380,136 |
| Operating expenses | 1,136,721 | 5,690,194 |
| Net earnings from operations | 745,254 | 3,689,942 |
| Fixed charges | 740,631 | 3,688,821 |
| Surplus | 4,623 | 1,120 |

Mr. Stotesbury in his letter of April 10, addressed to the chairman of the finance committee of councils, bearing upon the consent of the city to the proposed $10,000,000 loan, promised that extensions would be made to certain of the company's lines. The management now announces that these extensions have been practically completed.

### CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

| | Jan. 1. | Dec. 25. |
|---|---|---|
| Allis-Chalmers common (New York) | 1⅜ | 1⅜ |
| Allis-Chalmers preferred (New York) | 7⅝ | 8¼ |
| American Tel. & Tel. (New York) | 139⅝ | 139¾ |
| General Electric (New York) | 133½ | 155 |
| Kings County Electric (New York) | 129 | 129 |
| Postal Telegraph and Cables common (New York) | 79 | 81½ |
| Postal Telegraph and Cables preferred (New York) | 68 | 71 |
| Western Union (New York) | 78¼ | 79 |
| Westinghouse common (New York) | 66 | 67½ |
| Westinghouse preferred (New York) | *114 | *114 |

*Last price quoted.

| | Jan. 1. | Dec. 25. |
|---|---|---|
| Edison Electric Illuminating (Boston) | 294 | 293 |
| Massachusetts Electric common (Boston) | 21¾ | 21⅞ |
| Massachusetts Electric preferred (Boston) | 95 | 94 |
| New England Telephone (Boston) | 152 | 154 |
| | Jan. 1. | Dec. 25. |
| Electric Company of America (Philadelphia) | 12 | 12 |
| Electric Storage Battery common (Philadelphia) | 53 | 53 |
| Electric Storage Battery preferred (Philadelphia) | 53 | 53 |
| Philadelphia Electric (Philadelphia) | 16⅞ | 16⅝ |
| | Jan. 1. | Dec. 25. |
| Chicago Telephone (Chicago) | 136 | 136½ |
| Commonwealth Edison (Chicago) | 135¼ | 135¼ |
| National Carbon common (Chicago) | 110 | 106 |
| National Carbon preferred (Chicago) | 118 | 118 |

## PERSONAL MENTION.

HORACE LOWREY, of Minneapolis, Minn., has been appointed general manager of the Twin City Rapid Transit Company. He assumed the office on January 1.

F. X. CLEARY, who for three and one-half years was advertising manager of the Western Electric Company, is now associated with the Cheltenham Advertising Service of New York City.

FRANK COLVERT, of Gulfport, is the new district manager for the Cumberland Telephone Company, to succeed George D. Stockman, who has been elected secretary of the Commercial Club.

FREDERICK W. WHITRIDGE, present receiver of the Third Avenue Railroad Company of New York City, has been elected to the office of president and has announced his acceptance. Edward A. Maher has been elected general manager.

ALBERT SCHEIBLE, research engineer and solicitor of patents, has moved his office to Room 1519 Marquette Building, Chicago. Mr. Scheible is making a specialty of giving technical advice on inventive problems and methods of manufacture.

WILLIAM F. HAM, for a number of years comptroller and treasurer of the Washington Railway & Electric Company, has been elected first vice-president of that corporation. Mr. Ham succeeds General George H. Harries, who recently severed his connection with this company, to go with a Chicago corporation.

HORACE LOWRY has been appointed general manager of the Twin City Rapid Transit Company, Minneapolis, Minn., effective January 1. Mr. Lowry was connected with the company for some time prior to December, 1910, when he resigned to give his entire time to the Arcade Investment Company, of which he is president.

CALVERT TOWNLEY, assistant to the president of the Westinghouse Electric & Manufacturing Company, and Mrs. Mabel McCormick Steele were married at Memphis, Tenn., December 30, 1911. Mr. and Mrs. Townley will make their home at the Hotel St. Andrew, New York, after February 14.

IRA GOULD HOAGLAND has recently been made editor and manager of *Insurance Engineering*, a magazine published in the interest of good building construction and fire protection. Mr. Hoagland is a graduate of Pratt Institute, and has for some time been prominent in connection with insurance work. He has made a number of valuable contributions to the literature of fire prevention.

JAMES LYMAN, of Sargent & Lundy, consulting and designing engineers, presented on December 27, a copiously illustrated paper on the "Protection of High-tension Power Circuits and Apparatus," before a joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers. An abstract of this paper and the discussion on it will be given in the next issue.

LEONARD A. BUSBY, general counsel of the Chicago City Railway Company and of the Chicago City & Connecting Railways Company, has been elected president of the former corporation, this position having been vacated by the resignation of Thomas E. Mitten, as announced in these columns several weeks ago. Mr. Busby has previously served as counsel of various street-railway companies in and near Chicago.

ANGUS S. HIBBARD, of the American Telephone & Telegraph Company, New York City, spent last week among his many friends and relatives in Chicago, where he was so well known for many years as general manager and vice-president of the Chicago Telephone Company. On December 28 he acted in his old capacity as song-master at the banquet of the Chicago Association of Commerce, for which occasion he composed a number of new songs.

L. D. MATHES has taken charge of the Montgomery Light & Traction Company, Montgomery, Alabama, as general manager. The Light & Traction Company is the consolidation of the Montgomery Traction Company and the electric light and power business of Richard Tillis, including a new 5,000-kilowatt steam turbine plant just completed by the latter. Mr. Mathes has been one of the most successful managers of central station companies and street railway properties in the country, and until recently was general manager of the Union Electric Company, of Dubuque, Iowa.

S. GEORGE FREUND has established an office as consulting engineer at 100 Broadway, New York City. Mr. Freund will devote himself especially to establishing trade relations and business extensions between American and foreign, especially German, industries. He will also assist the American and German manufacturers in matters relating to importing, exporting, manufacturing and the exploitation of patents. Mr. Freund has been engaged in construction work in this country for a long time, and was connected with the electrical engineering department of the Interborough Rapid Transit Company, New York City, during the construction of the subway. He has established a European office in Berlin.

F. H. BETHELL, vice-president of the Bell Telephone Company of Pennsylvania and associated companies, was elected president of the Bell Telephone Company of Pennsylvania, the Delaware & Atlantic Telegraph and Telephone Company, the Diamond State Telephone Company, and the Chesapeake & Potomac Telephone Company, succeeding Union N. Bethell, who becomes chairman of the boards of directors of those companies. F. H. Bethell's identification with the telephone business in Philadelphia dates from 1906, when he came from Washington to assume the active management of the local Bell company. In the early part of 1911 he removed to New York to assume, in addition to his other offices, that of vice-president of the New York Telephone Company.

FRANK C. MASON has been elected an honorary member of the New England Historical Society. This Society consists of 600 members whose ancestors were early settlers of New England. Mr. Mason's family were among the earliest settlers of New England, Samson Mason having established a home there in 1620. The State of Connecticut in 1885 erected a bronze statue of Major John Mason at Mystic, Conn., to commemorate his achievements in the overthrow of the Pequod Indians in 1637, saving the settlement from destruction. Frank C. Mason was a pioneer telephone man and for many years was superintendent of telegraphs of the Police Department of Brooklyn, N. Y. Under the administration of Seth Low in 1884, Mr. Mason inaugurated the telephone system in connection with the police and fire service of that city and superintended the placing underground of all the wires of the Brooklyn Police Department. He was one of the organizers of the International Association of Municipal Electricians. Mr. Mason retired from active association with the electrical department several years ago, and purchased from his brothers the old Mason homestead at Washington Mills, N. Y., overlooking the Sauquoit Valley.

ARTHUR D. LITTLE, who was elected president of the American Chemical Society at its annual meeting in Washington, is president and general manager of Arthur D. Little, Inc., chemists and engineers, Boston, Mass. He has previously held the position of vice-president of this society, and has been chairman of the division of industrial chemists and chemical engineers. He was educated at the Massachusetts Institute of Technology, being a member of the Class of '85, and has been in independent practice for many years, having identified himself in the early days with the development of the sulphite process for wood fiber, chrome tanning, electrolytic bleaching and chlorate manufacture. He is a specialist in the chemistry of cellulose and fibers, fiber treatments and paper making, being the official chemist of the American Paper and Pulp Association, and the author of "The Chemistry of Paper Making." He is prominent in connection with the International Congress of Applied Chemistry, which is to be held in this country next year, and is president of the section on starch, cellulose and paper. His notable popular paper on "The Earning Power of Chemistry," which was read at the Indianapolis meeting of the American Chemical Society last year has attracted wide attention to the practical applications of chemistry in the reduction of manufacturing costs.

## NEW PUBLICATIONS.

COALS FOR ILLUMINATING GAS.—Under the title "Coals Available for the Manufacture of Illuminating Gas," the Bureau of Mines has prepared a bulletin giving a thorough treatment of the subject. The investigations were carried out by Professor White, assisted by Percy Barker and later by Dwight F. Smith.

THE MINERAL PRODUCTS OF CANADA.—Four bulletins published by the Canada Department of Mines take up thoroughly the production of the mineral resources of the Dominion. The bulletins are entitled: "A General Summary of the Mineral Production of Canada," "The Production of Cement, Lime, Clay Products, Stone and Other Structural Materials," "The Production of Coal and Coke," and "The Production of Iron and Steel." All deal with amounts produced, exported, etc., during the year 1910.

# With the Electrical Manufacturers

THE McROY CLAY WORKS, 445 Rookery, Chicago, manufacturers of conduit for telephone, telegraph, electric light and power cables, has issued its blotter-calendar for January, 1912, with an interesting message for the New Year.

THE OSHKOSH MANUFACTURING COMPANY, Oshkosh, Wis., lists a large number of logging tools, handles, hardware specialties, etc., in a recent catalog. The company was formerly known as the Oshkosh Logging Tool Company, the name having only recently been changed.

THE WALKER ELECTRIC COMPANY, Philadelphia, Pa., illustrates and describes a motor operated remote-control rheostat in a recent leaflet. The various parts of the mechanism are separately described and illustrations of the entire rheostat and the control switch are shown.

THE GATES POTTERIES, Chicago, Ill., has prepared a very attractive catalog listing a number of artistically designed pieces of Teco pottery. A number of these pictures are printed in color and are made in such a way as to carry out the original design throughout the booklet.

THE AMERICAN DISTRICT STEAM COMPANY., North Tonawanda, N. Y., has prepared a very attractive calendar which has been sent out as a New Years remembrance. The figures on the calendar portion are large, and the decorative feature, a picture of the birthplace of Washington is far above the ordinary.

ALFRED F. MOORE, Philadelphia, Pa., has prepared a clever advertising folder which has just been sent to the trade. The cover of the folder represents a "toboggan girl," while on the inside is a list of the company's wires and cables. A return card forms the fourth leaf and the two middle spaces contain a set of "New Year's Resolutions."

THE ALLEGEMEINE ELECTRICITATS GESELLSCHAFT, Berlin, Germany, has included a number of interesting articles in a recent number of its publication, the *AEG Journal*. One of these deals with the use of the steam turbine in the sugar industry, and another one describes a new installation and high-tension transmission system in Germany.

THE OTIS ELEVATOR COMPANY, New York, N. Y., is erecting a building on Eleventh Avenue, extending from Twenty-sixth to Twenty-seventh Streets, in which it will assemble part of its construction department and assembling department, and all of its executive and sales offices. At present the executive offices occupy part of the sixth floor in the Whitehall Building, and some of the company's offices are in Yonkers.

THE AMERICAN ELECTRIC FURNACE COMPANY, New York, N. Y., recently mailed a bulletin in which there are described a number of electric induction furnaces of different types. Comparisons are made showing the advantages of each system, and a description of processes is also given. Several illustrations are included showing the various operations and a number of diagrams give an excellent idea of the details of construction.

THE FLOUR CITY ORNAMENTAL IRON WORKS, Minneapolis, Minn., maker of the Corinthian street lighting standards, announces that it has secured an additional order for 200 Corinthian standards from the city of Minneapolis. This makes close of 1,000 Corinthian standards used in Minneapolis, and is said to give that city the distinction of having the largest number of cluster lights of any city in the United States.

THE FRANKS MANUFACTURING COMPANY, Rock Island, Ill., maker of the Franks adjustable fixture, has found it necessary to increase its quarters owing to the constantly increasing demand for its product. The company now occupies the lower floor of No. 1522 Fourth Street, and has more than twice as much available floor space as formerly. The Franks fixture is meeting with popular favor and the prospects of the company are exceedingly bright.

THE H. B. CAMP COMPANY, Chicago, Ill., has distributed a bulletin describing the manufacture of "Camp Duct" and the growth of the use of this product during the past few years. Illustrations of various installations are made use of, and one interesting double-page arrangement of engravings compares the effects of storm, heavy snows and accidents on overhead telephone and telegraph lines. The economy of avoiding such losses by the use of "Camp Duct" is made quite apparent. Several interesting tables of cost of installation are included.

WILLIAM MUELLER & COMPANY, 920 Postal-Telegraph Building, Chicago, are making preparations for an extensive cedar-pole business in 1912. The name Mueller is a familiar one to users of cedar poles. It has been identified with the cedar industry since 1862. William Mueller is without doubt one of the most popular men in the cedar trade, and is known to practically all the cedar-pole buyers. The Mueller Company is in a position to meet every demand in the cedar-pole line, and in addition handles the American Cross-Arm Company's cross-arms and pins.

THE INDEPENDENT ELECTRIC MANUFACTURING COMPANY, Milwaukee, Wis., announces that William J. Kenna will hereafter represent the firm in Chicago, Robert C. Tate having severed his connection as sales agent. The company wishes further to call attention to the fact that it will carry a complete line of apparatus, and will be able to fill rush orders from its Chicago stock. The company announces that hereafter it will be represented in Colorado by the Western Sales Company, Denver, who will stock a complete line of motor starters and controllers.

MATHIAS KLEIN & SONS, Chicago, makers of the well-known Klein construction tools, have had one of the busiest years of their career. Klein tools are used all over the world, and have been on the market since 1857. is meeting with popular favor and is The Chicago Grip, made by this firm, is greatly used, not only in the United States but in foreign countries as well. A shipment was recently made to Santiago, Cuba. The advantages of the wire skinner handled by this company are also becoming known throughout the country. An order for twelve was recently received from Tokio, Japan.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, East Pittsburgh, Pa., has issued an attractive little folder (No. 4213) of 12 pages, illustrating and describing the advantages and construction of types B, F, H and J oil circuit-breakers. These breakers cover a wide range of voltage and capacity, and are for switchboard and wall mounting, either hand or electrical operation. One feature of interest possessed by all of the breakers described is that of the arrangement which renders it impossible to hold the breaker in a closed position on a heavy overload or short-circuit.

THE WARD LEONARD ELECTRIC COMPANY, Bronxville, N. Y., has just issued a catalog descriptive of its automatic electric lighting system for automobiles. The advantages of electric lights over the other forms of illuminant are quite thoroughly gone over, and a short resume of the reasons why electric lighting for automobiles has not already become universal is given. The Ward Leonard system comprises three parts; a generator driven by gears on a silent chain; a storage battery; and automatic means for cutting the battery in and out of the circuit, depending for its operation upon the electrical condition of the circuit.

THE ELECTROSE MANUFACTURING COMPANY, Brooklyn, N. Y., recently suffered considerable loss from a disastrous fire which started in a factory building adjoining its plant. As the company was doing a large business and was at the time negotiating for additional space to take care of its increasing needs, the loss was more considerable than it might otherwise have been. A temporary office has, however, been opened at 109 Broadway in Brooklyn, and the company is making every effort to start a new plant in the shortest possible time, so that it can take care of its present contracts and its new business. In an announcement recently issued the statement is made that the company will be in position by February 15 to start up again.

THE RIDGWAY DYNAMO & ENGINE COMPANY, Ridgway, Pa., announces the opening on January 1, 1912, of a new district office in room No. 1417, Oliver Building, Pittsburgh, this move has been made in order that the company may better serve its many friends in the district and to facilitate the handling of its various well-known lines of steam engines and electrical apparatus. J. F. Rodgers, who is a native of Pittsburgh and enjoys a wide acquaintance among the mine, mill and manufacturing interests of the city and vicinity, has been secured as local manager. Mr. Rogers will be glad to welcome his friends and all friends of the Ridgway Dynamo & Engine Company, at its new office and to render any possible service.

THE TUNGSTOLIER COMPANY, Conneaut, Ohio, has recently issued an illustrated catalog No. 110, briefly describing the unique features embodied in T T C Tungstolier separable lighting fixtures. Attention is called to the opportunities afforded by these fixtures, due to the easily affected interchange of their parts, for evolving various styles or types of fixtures to suit the individual tastes or the architectural requirements of any specific lighting installation. By means of a cut-leaf method employed in illustrating the various parts, 648 different assembled views of a two-arm fixture are made possible by merely rearranging and turning the four cut sections on which the parts are pictured. The Tungstolier Company will supply copies of this catalog on request.

THE VALENTINE-CLARK COMPANY, Minneapolis, Minn., announces that it has furnished several train-loads of treated poles to the Stone & Webster Corporation to be used in the Mississippi River dam work at Keokuk, Iowa. The company has also shipped several thousands of poles to be used in the Kansas City & St. Joseph Interurban project. The Valentine-Clark Company considers its moving to Minneapolis nine months ago very fortunate. The company claims that its sales have increased over 60 per cent in 1911 over 1910. The fact that the general office is located in Minneapolis puts the company in close touch with its largest main yard at Minnesota Transfer (St. Paul), where it carries a large stock of western and northern cedar poles, and where also is located its open-tank treating plant for treating the butts of cedar poles. The company recently opened a sales office at St. Maries, Idaho, from which point it is in a position to handle any orders from customers west and south of the Rocky Mountains and from Texas. The company is one of the oldest operating cedar companies and is known for the excellence and quality of its poles and for its promptness in making deliveries.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., is just issuing its 1912 catalogue of electric fans. The publication is an attractive one printed in colors, and contains descriptions and illustrations of the fans manufactured by that company for use in the home, office and public places. The line of fans comprises those suitable for use on desk or table, and which are manufactured with fan diameters of 8, 12 and 16 inches. The publication contains also illustrations and descriptions of the ceiling and column fans manufactured by the company, and a line of supply parts for these. Bulletin No. 4897 illustrates and describes an improved type of the G-E Edison Mazda lamp suitable for use in train lighting. These lamps are made in two voltage ranges: 25-34 and 57-65, and in wattages of 15, 25 and 50. In Bulletin 4902, are listed direct-current switchboards of 125 and 250 volts for controlling three-wire generators up to 200 kilowatt capacity, and two-wire or three-wire feeder circuits up to 1,200 amperes. These panels are so designed that the appearance of both the front and back of the switchboard will be neat and uniform. Bulletin No. 4908 is devoted to the subject of the lighting of hotels, cafes and clubs. It contains illustrations of many hotels, restaurants, etc., which are accompanied by a statement of the number and kind of lamps used in lighting. In addition to this, the publication contains the history of the development of the incandescent lamp, which should be of general interest. In Bulletin No. 4912 is a collection of several articles devoted to the use of the General Electric ozonizers for air purification. Various applications are illustrated.

### Dates Ahead.

American Institute of Consulting Engineers. Annual meeting, New York City, January 16.

Northwestern Cedarmen's Association. Minneapolis, Minn., January 23 and 24.

Western Electrical Inspectors' Association. Milwaukee, Wis., January 23-25.

National Independent Telephone Association. Annual convention, Chicago, Ill., February 7, 8 and 9.

Wisconsin State Telephone Association. Annual meeting, Madison, Wis., February 14-15.

Minneapolis Electric Show, Minneapolis, Minn. March 16-23.

Minnesota Electrical Association. Minneapolis, Minn., March 20-22.

National Electric Light Association. Next annual convention, Seattle, Wash., June 10-14.

National Electrical Contractors' Association. Annual meeting, Denver, Colo., July 17-20.

The 1912 Boston Electric Show. Mechanics Building, Boston, Mass., September 28-October 26.

# Record of Electrical Patents.

## Issued by the United States Patent Office, December 26, 1911

1,012,582. SUSPENSION LOOP FOR ELECTRIC FIXTURES. R. S. Aspinwall, assignor to Virden Manufacturing Co., Cleveland, O. A split ring is secured to the end of the fixture stem by means of a threaded thimble.

1,012,585. PRINTING APPARATUS. G. G. Bain, New York, N. Y. Within a box is an incandescent lamp whose circuit is closed when a photographic printing frame is slid over the box.

1,012,590. ELECTRIC DOOR ALARM. C. F. Bobo, Brooklyn, N. Y. Filed July 31, 1908. A circuit-closer operates when the door is opened.

1,012,599. PROTECTOR FOR POLYPHASE ELECTRICAL MACHINERY. J. G. Clemens, Buffalo, N. Y., assignor of one-half to Frank H. Kaiser, Buffalo, N. Y. A fused knife-blade switch is kept closed by a magnetic lock that releases on failure of the current in any phase.

1,012,617. ELECTRIC RADIATOR. G. Egley, assignor to Gebrüder Siemens & Co., Herzberg, near Berlin, Germany. The end of the heating rod is secured by two metallic conical sleeves within a cap to which the terminal wire is attached.

1,012,623. AUTOMATIC SIGNALING APPARATUS FOR ELEVATORS. A. A. Fuller, Birmingham, Ala. A starting-signal system for a group of elevators includes shaft switches near the top and bottom of each shaft and signals controlled thereby.

1,012,624. TANK-LEVEL SIGNAL. S. H. Gallagher, Carthage, N. Y. A float in a casing attached to a fuel-oil tank closes an electric alarm circuit when the oil level drops to a certain point.

1,012,655. DISPLAY APPARATUS. K. Koike, Seattle, Wash. Electromagnetic means alternately connect and release a driver from a slide carrier.

1,012,665. PROCESS FOR ELECTROPLATING WITH ZINC. A. A. Lemetre, Paris, France. The electroplating bath contains zinc sulphate, ammonium chloride, sodium sulphate, sulphuric acid, and water.

1,012,669. ELECTRIC HEATING APPARATUS. H. Löfquist, Stockholm, Sweden. A stove for heating rooms includes resistance elements surrounded by walls of steatite, a contact thermometer and a circuit-breaker which operates when the temperature attains a predetermined degree.

1,012,691. BURGLAR ALARM. A. Myers, Philadelphia, Pa. Opening of the door operates a cable that closes the alarm circuit.

1,012,699. TELEPHONE SYSTEM. A. E. Paige, Philadelphia, Pa. There is a vault at each subscriber's station giving access to the telephone; opening of the vault door operates a circuit-closer that controls a signal device at the central exchange.

1,012,706. GAS OR VAPOR ELECTRIC LAMP AND HEATER CONNECTED THEREWITH. H. N. Potter, assignor to Cooper Hewitt Electric Co. A heater wire is wound outside of the cathode part of the tube.

1,012,721. TIME SWITCH. F. Schmid, Jr., Philadelphia, Pa. A clock operates a disk that releases a spring-controlled switch.

1,012,724. INSULATOR SUPPORT. E. O. Sessions, assignor of one-half to Fay Woodmansee, Chicago, Ill. A wooden insulator pin fits into a metallic cup that extends upward within the petticoat of the insulator.

1,012,730. HIGH-TENSION MAGNETO-ELECTRIC MACHINE. F. R. Simms, assignor to Simms Mag-

neto Co. An extension at one end of the armature contains a condenser.

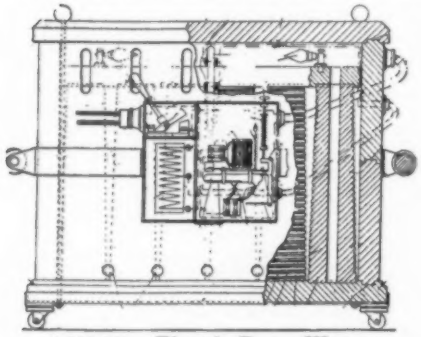
1,012,751 and 1,012,752. STORAGE-BATTERY SEPARATOR. W. Taylor, assignor to Electric Storage Battery Co., Philadelphia, Pa. Wood separators made of treated and dried cypress or redwood.

1,012,753. ELECTRIC SWITCH. P. H. Thomas, assignor to Cooper Hewitt Electric Co., New York, N. Y. A rotatable barrel-shaped tube contains a layer of mercury adapted to close the gap between two sealed-in contacts which engage external spring line terminals.

1,012,780. SERVICE-METER SYSTEM. C. S. Winston, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. The telephone operator actuates the meter by means of a switch and at the same time cuts off a supervisory signal.

1,012,793. TELEPHONE - SERVICE METERING SYSTEM AND APPARATUS. G. Babcock, assignor to Telechronometer Co., Rochester, N. Y. The circuit contains two oppositely polarized magnets, one actuating the service meter and the other a time-recording meter.

1,012,798. AUTOMATICALLY OPERATED ELECTRIC SWITCH. I. C. Bell, Pittsburgh, Pa. A clock-controlled time switch.



1,012,669.—Electric Room Warmer.

1,012,806. ELECTRIC SWITCH. F. Buchanan, Dayton, O. A spring snap switch.

1,012,808. METHOD OF PURIFYING WATER. W. B. Bull, assignor to Chloride Process Co., Chicago, Ill. Chlorine is obtained by electrolysis of a saline solution and used in the production of iron chloride as a water-purifying agent.

1,012,809. APPARATUS FOR PURIFYING WATER. W. B. Bull, assignor to Chloride Process Co. The apparatus for employing the preceding method is described.

1,012,812. AUTOMATIC ALARM. C. Centoni, Chicago, Ill. A box containing a battery and alarm is arranged so that the alarm circuit is closed when the box is lifted, provided the box has previously been locked.

1,012,821. APPARATUS FOR SUPPLYING FLUID-PRESSURE. H. H. Cutler, assignor to Cutler-Hammer Manufacturing Co., Milwaukee, Wis. A motor drives an air compressor through an electromagnetic clutch, which is controlled through a generator driven by the motor, a solenoid switch and a pressure switch.

1,012,828. STORAGE BATTERY. T. A. Edison, assignor to Edison Storage Battery Co., West Orange, N. J. Separators are made of insulating strips arranged to engage two adjacent tubular pockets on one plate and only one flat pocket on the opposite plate.

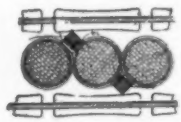
1,012,845. PROCESS OF IMPROVING CERTAIN MAGNETIC QUALITIES OF A MAGNETIC BODY. R. A. Hadfield, Sheffield, England. Permiability is increased and hysteresis decreased by heating a magnetic body to a point within the "gamma" range, and then cooling.

1,012,852. ALARM FOR BOATS. C. L. Hoffman, Detroit, Mich. Leaks are detected through the raising of a float, and the consequent sounding of an electric alarm.

1,012,854. SOUND-INTENSIFIER FOR TELEPHONES. W. Hoppie, Ogden, Utah, assignor of one-fourth to W. Counts, Sparks, Nev., and one-fourth to A. G. Horn, Ogden, Utah. Vibrations of one diaphragm are transmitted through a lever to a second diaphragm.

1,012,865. BURGLAR AND FIRE ALARM AND TELEPHONE SYSTEM. A. Köhler, Chicago, Ill. A vibrator in a closed circuit begins operation when disturbed, sounding an alarm bell in a second circuit.

1,012,878. ELECTRIC BRAKE. J. N. Mahoney, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. The controller has two sets of contacts, one for power and one for braking; the brake acts in either direction.



1,012,828.—Storage Battery Separator.

1,012,889. ART OF FORMING DIELECTRIC FILMS. R. D. Mershon, New York, N. Y. The films are formed on the electrodes at a temperature 50 to 100 per cent higher than they will be afterward subjected to.

1,012,908. STORAGE BATTERY. H. L. Peterson, Charles City, Iowa, and J. M. Petersen and A. O. Retrum, Dawson, Minn. Active material is held in place on the plates by a diagonal series of projecting parts; the plates are surrounded by perforated plates of acid-proof material.

1,012,913. AUTOMATIC ELECTRICAL FIRE-EXTINGUISHER. S. B. Priest, Washington, D. C. A tank containing different chemicals is put in operation, the valves adjusted and an electric alarm sounded in case of fire.

1,012,919. ANTISEPTIC TELEPHONE MOUTHPIECE. I. S. Rosenblatt, San Francisco, Cal. The mouthpiece is filled with an antiseptic absorbent material.

1,012,934. ELECTRIC METAL-WORKING APPARATUS. E. Thomson, assignor to Thomson Electric Welding Co., Lynn, Mass. Current is supplied by any of a number of arms, containing varying inductances, so that current may be distributed to the work as desired.

1,012,952 and 1,012,953. THERMOSTAT. G. P. Wild, assignor to F. W. Schmidt, Philadelphia, Pa. The thermostat is contained in an acid-resisting casing, filled with acid solution.

1,012,956. VIBRATOR FOR SIEVES. W. C. Woodland, Warren, O. A hand-driven alternator supplies current to a magnet which vibrates the sieve.

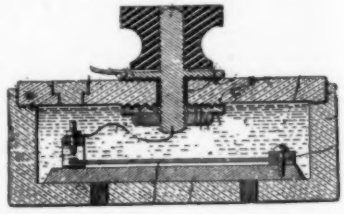
1,012,970. ATTACHMENT PLUG. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co., Chicago, Ill. The binding posts are arranged so that they are easy to reach.

1,012,971. ELECTRICAL CONDUCTOR-GRIP. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co. A clamping member holds the conductors in place; the plug as assembled screws into a lamp socket.

1,013,029. ELECTRICAL BONDING. S. Blake, assignor to Federal Electric Co., Chicago, Ill. A pivot and a spring are so arranged as to permit of both longitudinal and rotatable movements of the plug member.

1,012,029. ELECTRICAL BONDING DEVICE OR RAIL-CONNECTOR. J. M. Lorenz, Chicago, Ill. A tapered pin has a longitudinal groove for receiving the bond.

1,013,048. SPARK PLUG. C. B. Nelson, Lindsborg, Kans. The sparking point is protected by a ball valve which is forced into position by each explosion.



1,012,952.—Thermostat.

**Reissue.**

13,343. ELECTROLYTIC PROCESS OF PRODUCING NITROGEN COMPOUNDS. C. E. Acker, Ossining, N. Y., assignor to Nitrogen Co. Consists in part of electrolyzing a molten compound of a metal capable of forming nitrogen compounds.

**Patents That Have Expired.**

Following is a list of the electrical patents (issued by the United States Patent Office) that expired January 1, 1912:

531,961. CIRCUIT CONTROLLER. Thomas Parker, John H. Woodward and Edmund S. G. Rees, Wolverhampton, England.

531,970. ELECTROSTATIC VOLTMETER. Henry A. Rowland, Baltimore, Md.

531,978. ELECTRIC ARC LAMP. Charles E. Scribner, Chicago, Ill.

531,980. ELECTRIC RAIL BOND. George E. Somers, Bridgeport, Conn.

531,996. ELECTRIC CONVERTER. Robert H. Hassler, Pittsburg, Pa.

532,003. ELECTRIC SIGNALING APPARATUS. George E. Miller, Saugus, Mass.

532,009. ELECTRIC SEMAPHORE SETTING DEVICE. Homer A. Parrish, Jackson, Mich.